PUBLIC WORKS

July
1952

CITY, COUNTY AND STATE

How Florida Improves Substandard Roads

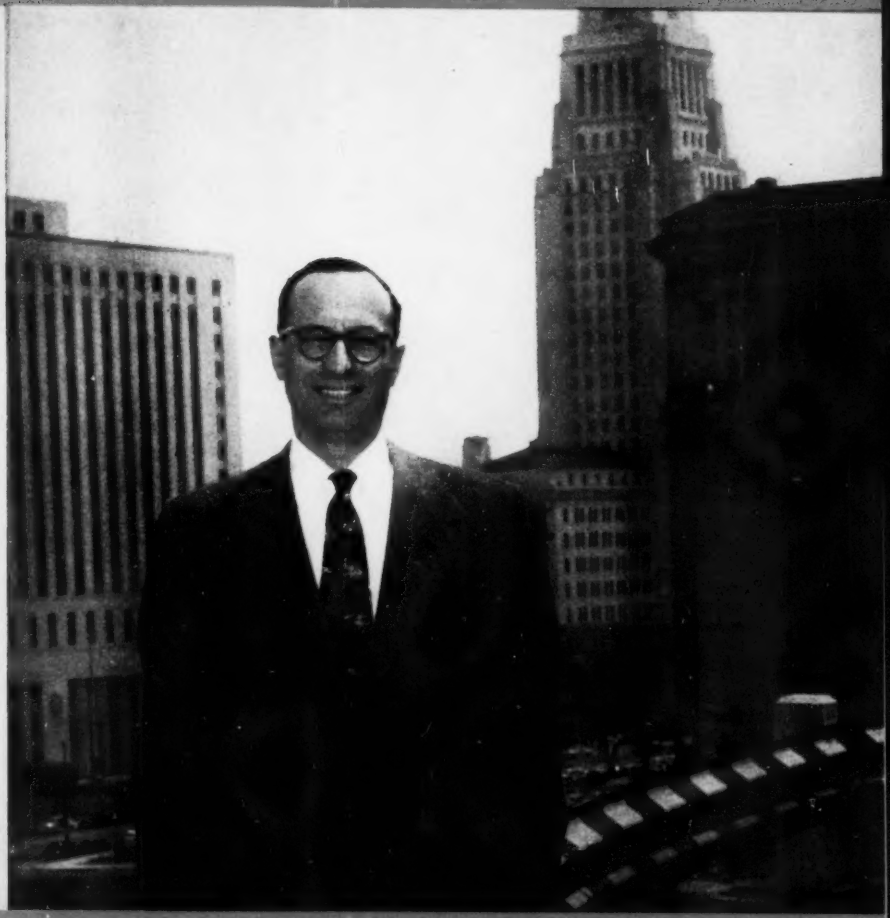
Jointing Materials for Cast Iron Pipe

A Study of Sludge Dewatering

Rodent Control by a Baited Buffer Strip

Latest Design Features for Mountain Freeway

Soil Data Essentials for Subsurface Waste Disposal



Milton Offner, secretary of the Board of Public Works of the City of Los Angeles and Vice-President, Western Area, of the American Public Works Association, shown in his own Los Angeles. More on p. 18.

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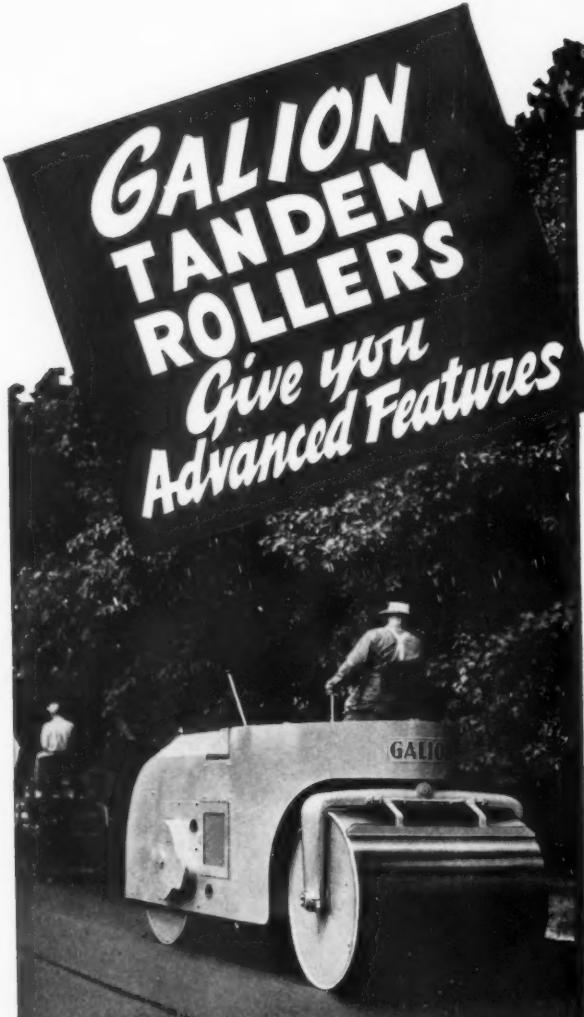

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Aeration Tanks, Fairfield, Connecticut Sewage Treatment Plant, with Chicago Swing Diffusers and Precision Diffuser Tubes. Air is supplied by three Chicago Standardaire Blowers. Two Blowers are direct connected to electric motors and have a capacity of 2000 cfm each at 6.5 psi. One Blower is direct connected to a gas engine and has a capacity of 2100 cfm at 6.5 psi. Design flow of the plant is 4 M.G.D. Bowe, Albertson & Associates, Engineers.

The City of Fairfield, Connecticut, is assured of continuous and economical operation of the aeration battery in their new Activated Sludge Sewage Treatment Plant. Bowe, Albertson & Associates, Engineers, specified a Chicago Air Diffusion System to provide complete equipment for sewage aeration. Everything necessary from air to water is specifically designed and engineered as a unit to treat sewage and industrial wastes. The Chicago Standardaire Blower, Swing Diffusers and Precision Diffuser Tubes provide efficient, quiet, continuous operation at low cost. Over 100 Chicago Air Diffusion Systems have been specified or installed in Sewage Treatment Plants.

Other Chicago Sewage Equipment makes possible the most economical and efficient operation of the plant. Two Chicago Comminutors cut coarse sewage matter into small settleable solids without removal from the channel. One 10″ and two 8″ Chicago Vertical Open Shaft Non-Clog Pumps handle the raw sewage. Everything was done to provide the City of Fairfield with a Sewage Treatment Plant that would deliver a clear, sparkling effluent. Shellfish beds in Long Island Sound and the recreational aspects of the surrounding waters will not be contaminated.

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CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

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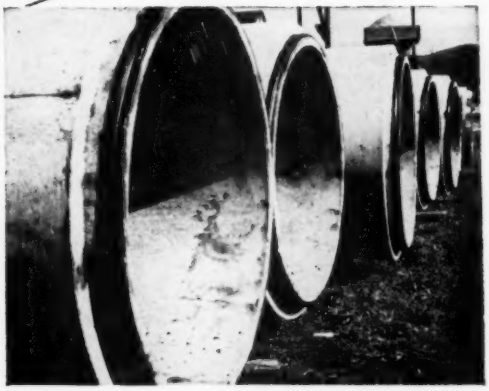

Pipe can be stockpiled within a few feet of installation ditch. (Note rubber gaskets.) It's then lifted by crane and lowered into position. So remember, Universal can . . .

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THE EDITOR'S POINT OF VIEW

Climatic Factors Should be Considered in Engineering Design

SERIOUS frost and snow are unusual ocurrences in a considerable portion of the United States. In many phases of engineering, climatic conditions are an important factor in design. Since much of the basic study in such branches of engineering as sewage treatment were developed in the northern states, allowances for climatic factors were natural. Many of the resulting standards were adopted practically *in toto* by southern states. The result, at times, has been the employment of an unnecessary and costly factor of safety.

It is a sign of the times that the South is beginning to stand on its own feet and to develop its own standards. Recent investigations at the University of Florida have been marked by an enviable degree of freedom of thought and have resulted in information that may permit satisfactory designs at lower costs. For instance, it has been shown that northern standards for sludge bed areas are excessive for Florida conditions; that settling tank retention periods may perhaps be reduced; that trickling filters ripen more quickly and may give better results; and that digestion tank requirements may be less severe.

This is fine, and we congratulate the Florida folks. More such work is needed to reduce our standards to those consistent with the job to be done under the conditions that actually exist. The time-honored factor of ignorance should be "outened"—to use a good southern rural term.

Common Sense in the Matter of Rodent Control for Cities

BECAUSE we believe that rodent control is important, we have given considerable space to the subject. The material we have published has included data on methods of collection and disposal of garbage and refuse—one of the essential factors in obtaining rodent control; information on methods of organizing rodent control campaigns; and data on rodenticides—poisons—and accessory equipment.

We do not believe that, except in unusual situations, rat control by building modifications, the so-called rat-proofing, is either effective or economically feasible. The exponents of this method have been rather vociferous in their claims that they were the only true prophets. Yet in our large cities, as New York, a ratproofing program would be economic foolishness. Even in much smaller cities, ratproofing has not been effective over any extended period of time, but has been costly and time-consuming.

In New York City, to provide roughly semiannual inspection of conditions in the badly infested areas of the city would cost about a million and a half dollars a year. No one dares to estimate how many men it would take, how much it would cost, or how long would be required to put in effect a ratproofing program in New York that would have any effect on the situation. In the Harlem area alone there are 25,000 apartment buildings needing such repairs.

Many poisons have been tried out. The best up to this time appears to be warfarin. It has been effective under difficult conditions of use and is safe and simple to employ. The use of this modern rodenticide, coupled with good municipal housekeeping, can reduce materially the rodent population of this country. The formula is: Kill first; clean up and dispose properly of all rodent food; and, if there is any money left, carry on modified stoppage and ratproofing. And in employing this formula, full use should be made of professional exterminators.

How Much Have Materials Allocations and Shortages Slowed Construction?

NOT long ago we were asked the question heading this paragraph, with especial reference to the sewage disposal field. On the basis of our own observation and experience, we were sure that actual adverse effect was very small. But to be sure, we wrote to six or eight engineers whose positions in the field are such that they are able to observe what has happened and is happening.

The replies were practically unanimous that the only effect has been to provide an alibi for the few cities and industries which never wanted to go ahead anyway. The regulations on materials allocations have merely confirmed the fainthearted in hesitating, but have scarcely affected anyone else.

We regret we are not free to publish these letters at this time. They provide an interesting documentation on what has happened; and they uniformly predict a big year for 1953.

Civic Pride

BEFORE. A Bullclam spreads refuse before crushing it beneath the specially-curved Bullclam front. This unit is Marietta's "one-man sanitation squad."

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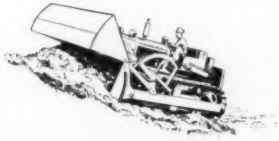
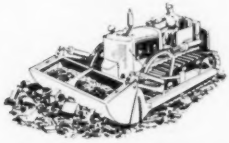
in a City Dump

Fast-growing Marietta, Georgia, relies on an International Crawler with a Drott Bullclam to please both old-time citizens and new jet-bomber industry



Prepares the site



Crushes and compacts refuse

Transports and spreads earth cover

Grades and levels finished area

"Our city of 20,800 got a big boost when Lockheed set up a B-47 jet bomber plant here," says Byron Wallace, head of the Sanitary Department of Marietta, Georgia. "But then our city incinerator broke down.

"A new one would cost $75,000, so we began burning our refuse in an open dump. It was a stinking, smoking nuisance. Lockheed wanted no part of it. Our citizens didn't either. But who had $75,000?

"Then we 'got Drott.' We got a Drott Bullclam on an International Crawler. Now we bury our garbage completely every other day. The sanitary fill is improving our land, and the Crawler-Bullclam is so efficient we don't see how any lower-cost disposal is possible."

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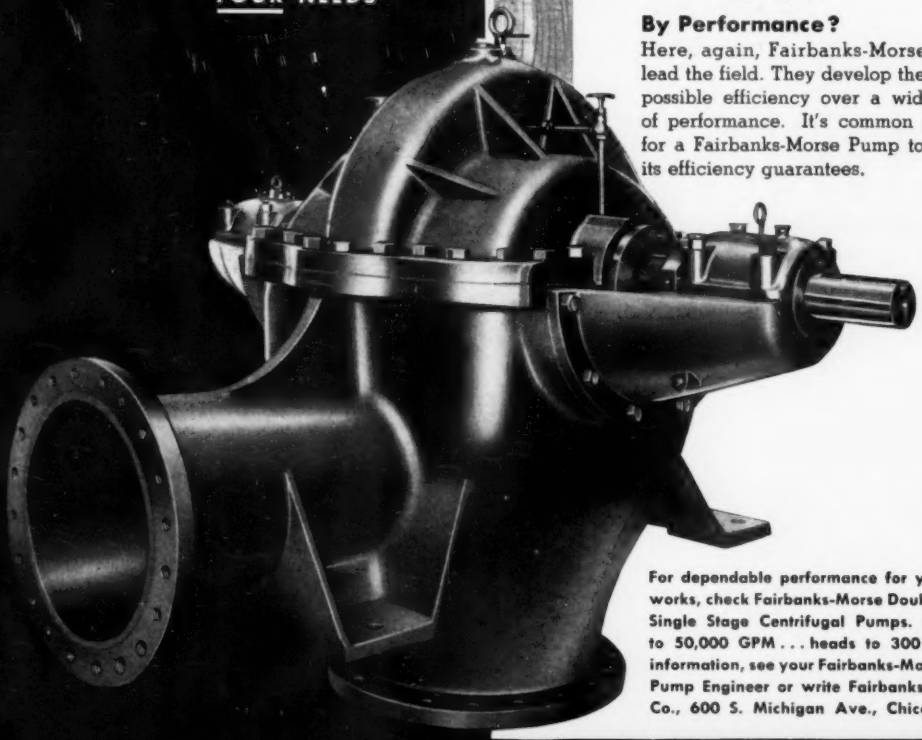

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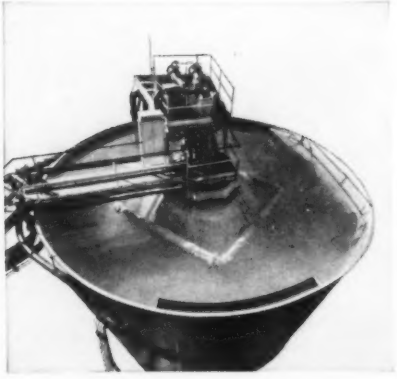

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San Bernardino County, Calif., has built a flood control ditch which — after a storm — is as heartening to see as a rainbow. The 1.3 mile ditch carries off flood waters of nearby Daley Canyon.

The ditch — 20 and 15 feet wide and 8 feet deep — is another example of "Caterpillar" teamwork. To grade the bottom of the ditch and backfill the sides, the county used a few of the talents of the work-happy "Cat" No. 12 Motor Grader. The ditch was dug by a Northwest Shovel powered by a "Caterpillar" Diesel D13000 Engine.

On every job, the No. 12 Motor Grader can contribute something. After helping out with the ditch construction in San Bernardino County, it returned to its road maintenance chores.

Its versatile nature, coupled with the long life built into every "Caterpillar" machine, makes this motor grader vital to any complete maintenance and building program. Your "Caterpillar" Dealer will show you how the No. 12 Motor Grader and other "Caterpillar" equipment cut down costs by stepping up efficiency.

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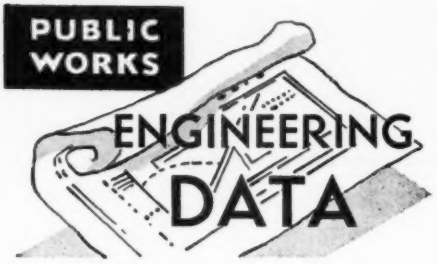


Off-Street Parking that Makes Money for the City

There are more than 25,000 registered cars in the city of Ann Arbor, Mich., and there are about 3,500 additional cars belonging to students. These cars create a serious traffic problem and an almost insurmountable parking problem. In 1947, the city created the Ann Arbor Automobile Parking System, an entity able to borrow money on revenue bonds for which the money collected through parking meters and from the lots and/or garages constructed for this purpose as security. The following year, $630,000 was borrowed and six lots were purchased, care being taken to select the best lots available.

At present, there are six lots in operation, one of which is a 3-deck structure. Capacity is about 700 cars and present plans call for an additional 500-car capacity. The system was established to furnish cheap parking for the first two hours, with a charge of 5 cents an hour for the next two hours. With this very low charge, the profit for 1951, after all expenses, was about $80,000. According to the Mayor of Ann Arbor, William E. Brown, who presented these data at the Fourth National Businessmen's Conference on Urban Problems, profit is now running about $110,000 a year. In addition, fines have increased from about $10,000 a year before meters to about $32,500 this year.

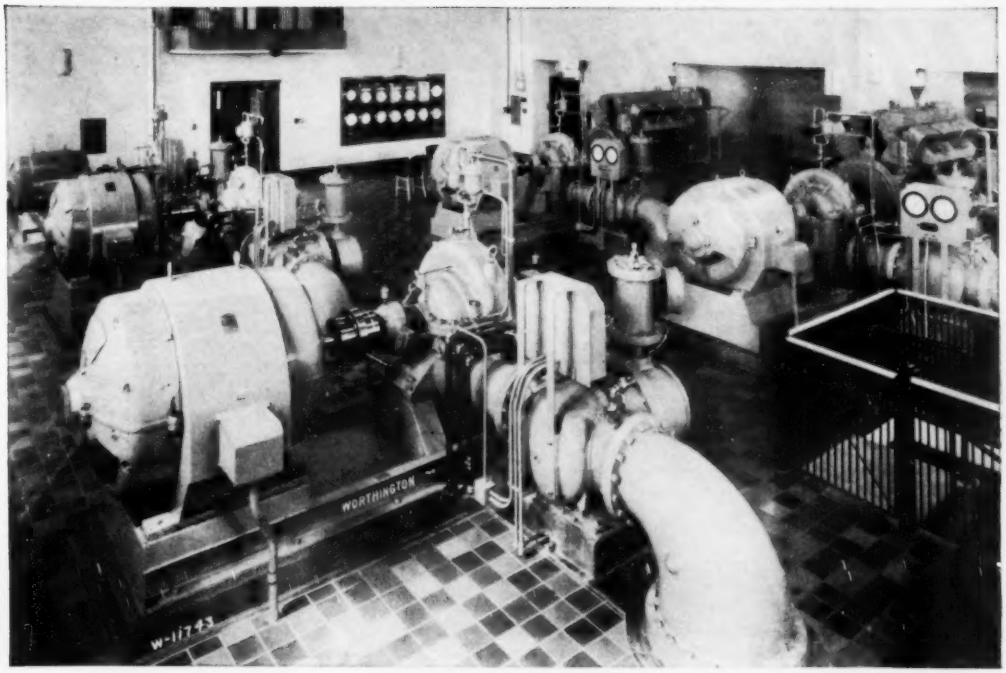
As a part of the program of solving the parking problem, the University of Michigan was interested and it has provided for its employees and students about 2,450 parking spaces in some 40 different locations.

Sanitary Fill Operations in San Francisco

Some 277,240 tons of garbage and refuse were handled in San Francisco during the calendar year 1950. This was disposed of on a sanitary fill along San Francisco Bay, south of the city. Cost of disposal was 91.8 cents per ton, not including cover, which is of earth and rock 1½ to 2 ft. in depth. A total of 201,040 cu. yds. of cover material was required, or 0.726 cu. yd. per ton of refuse. The cost for this cover material was 48.7 cents per cu. yd. The estimated average weight of refuse and garbage per cu. yd. was 364 pounds, and the average truckload weighed 3.28 tons.

DDT for Chironomous Larvae

Information on the use of DDT for controlling Chironomous larvae, or red worms, in reservoirs, has been published by A. B. Ritter of the Louisiana State Department of Health, New Orleans, La., according to Don Bloodgood.



AS MODERN AS YOU'LL SEE ANYWHERE is this clean tile brick pump building at Evanston, Illinois, Water Works. At the left are three High Lift pumps—6-mgd, 8-mgd and 15-mgd—driven by Electric Machinery motors. At right are two 10-mgd High Lift pumps dual-driven by 350-hp E.M. motors and gasoline engines. Three other 125-hp Wash Water pumps are not shown.

Evanston Water Works– First on the North Shore– boasts modern Worthington-equipped pump room

In the 1890's, it was Evanston, Illinois, that set the pace in water works facilities along the North Shore with the first filtration plant.

Today, this famous midwest city is still known by municipal engineers everywhere for its modern and efficient water-supply installation. The pump room pictured here is a vital part of these facilities.

Built in 1949, the new building houses eight motor-driven Worthington centrifugal pumps including three 10-mgd Wash Water pumps and three High Lift pumps—one 15-mgd, one 8-mgd and one 6-mgd. Two 10-mgd High Lift pumps are dual-driven. The complete water works installation was engineered by Alvord, Burdick and Howson of Chicago, Illinois, Consulting Engineers.

You'd naturally expect cities like Evanston, with reputations for the best in water works facilities, to demand the best in pumping equipment. Their choice is proof that *there's more worth in Worthington*. Worthington Corporation, formerly Worthington Pump and Machinery Corporation, Public Works Division, Harrison, New Jersey.

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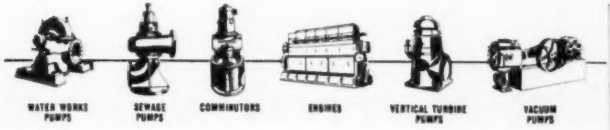

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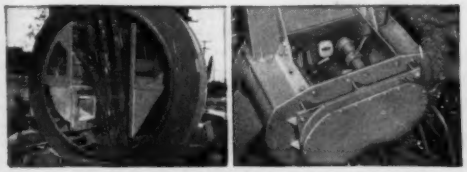
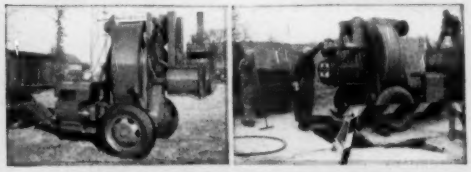
material you want ..where and when you like it

the NEED

During the war our roads took a terrific beating—while new construction and repair programs were cut to a minimum. Since the war, in the face of ever heavier traffic loads, rising costs and lack of funds continue to limit new construction and place an even greater burden on maintenance programs in city, town, county and state. Road maintenance is primarily patching—the "stitch in time" that prevents major breakups. Yet until the advent of the new Mixall, an efficient and economical means of producing all types of hot, high-quality patch material has not been available.



***ROTARY DRUM DRYING AND HEATED TWIN SHAFT PUGMILL MIXING** under independent control mean that the Mixall produces the finest hot patch material, regardless of the type needed.*



***NO SETUP TIME REQUIRED:** the Mixall doesn't have to be unhitched from the truck unless the truck is needed elsewhere. Even unskilled labor can quickly become expert at Mixall operation.*

is ANSWERED

MUNICIPALITIES: the Mixall makes possible immediate attention to patching and other maintenance needs regardless of quantity of mix, type of mix or location of job. The Mixall takes mixing out of the pit and right to the job, wherever you want it.

CONTRACTORS: a virtually untapped market promises profit to those who go after it with the Mixall—driveways, sidewalks, barn floors, railroad crossings, outdoor storage areas, service stations, parking areas, tennis courts, playgrounds, etc.

SEE IT IN OPERATION: Complete demonstration programs are being carried out by Barber-Greene Distributors who are also presenting the sound-color movie, "Here Is The Answer." Get in touch with your B-G Distributor and arrange to be present. In the meantime, fill in the coupon and send for more complete details.

A small, highly portable unit, capable of on-the-spot production of even the highest types of hot mixes comparable to those produced in Barber-Greene's largest continuous hot mix plant—*that* is the Mixall. Its range of usefulness extends throughout the field of road maintenance into small paving and resurfacing jobs. With the Mixall, municipalities, maintenance engineers and contractors need no longer resort to inferior cold patch material or be dependent upon the type of mix currently being produced by their local central plant sources.

Barber-Greene Company
Aurora, Illinois

Send me the descriptive 8-page bulletin on the Mixall.

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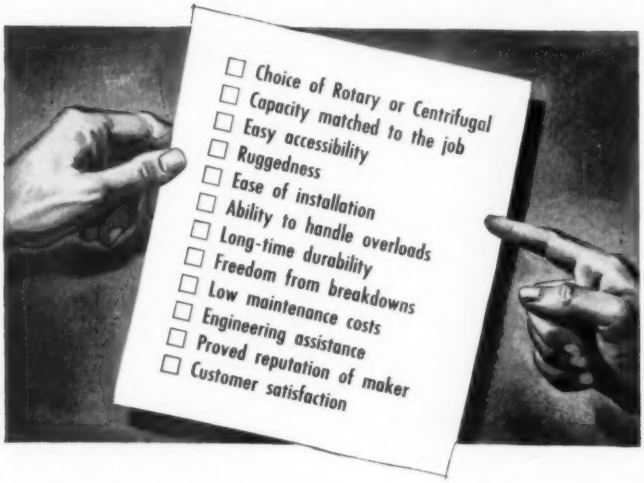
☐ Choice of Rotary or Centrifugal
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☐ Easy accessibility
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☐ Ease of installation
☐ Ability to handle overloads
☐ Long-time durability
☐ Freedom from breakdowns
☐ Low maintenance costs
☐ Engineering assistance
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☐ Customer satisfaction

When operation of sewage treatment plants depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

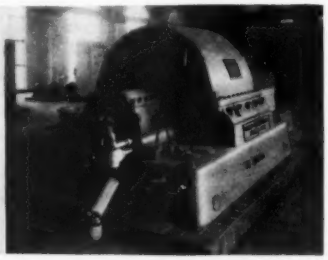
Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in sewage treatment applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Poplar Avenue, Connersville, Indiana

CENTRIFUGAL

Motor-driven, 16,000 cfm Centrifugal Blower in large metropolitan sewage treatment plant. Three high-capacity R-C Rotary Blowers are also included in this installation.



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BLOWER BUILDERS SINCE 1854
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LEADERS IN THE PUBLIC WORKS FIELD

★

Milton Offner, the subject of our front-page photo, got a 60-day appointment in the summer of 1917 with the Bureau of Engineering of the Department of Public Works of Los Angeles—and he's been there ever since. His first duties were as timekeeper, paymaster, supply purchaser, chainman and general roustabout. Now, thirty-odd years later, he heads four divisions of the Department of Public Works—Executive, Accounting, Custodial and Communications—and is its secretary. The Board has some 5,000 employees and a budget of about sixty million dollars.

He is Western Area vice-president of the American Public Works Association and, in 1948, received the Service Award (then the Veteran's Award). He also belongs to many fraternal, civic and philanthropic societies, in most of which he is or has been an officer. His hobbies are pictorial photography and "monkeying in my machine-and-woodworking shop, which has more equipment and less productivity than any other I know of." Now, with the preparations for the APWA convention, which will be held in Los Angeles in August, "cobwebs surround my cameras and rust is fast covering my shop machines and tools." But Mrs. Offner says this has some advantages for he hasn't lost a finger on one of his machines for quite a while now.

clarify wastes at least cost...

the Cyclator®

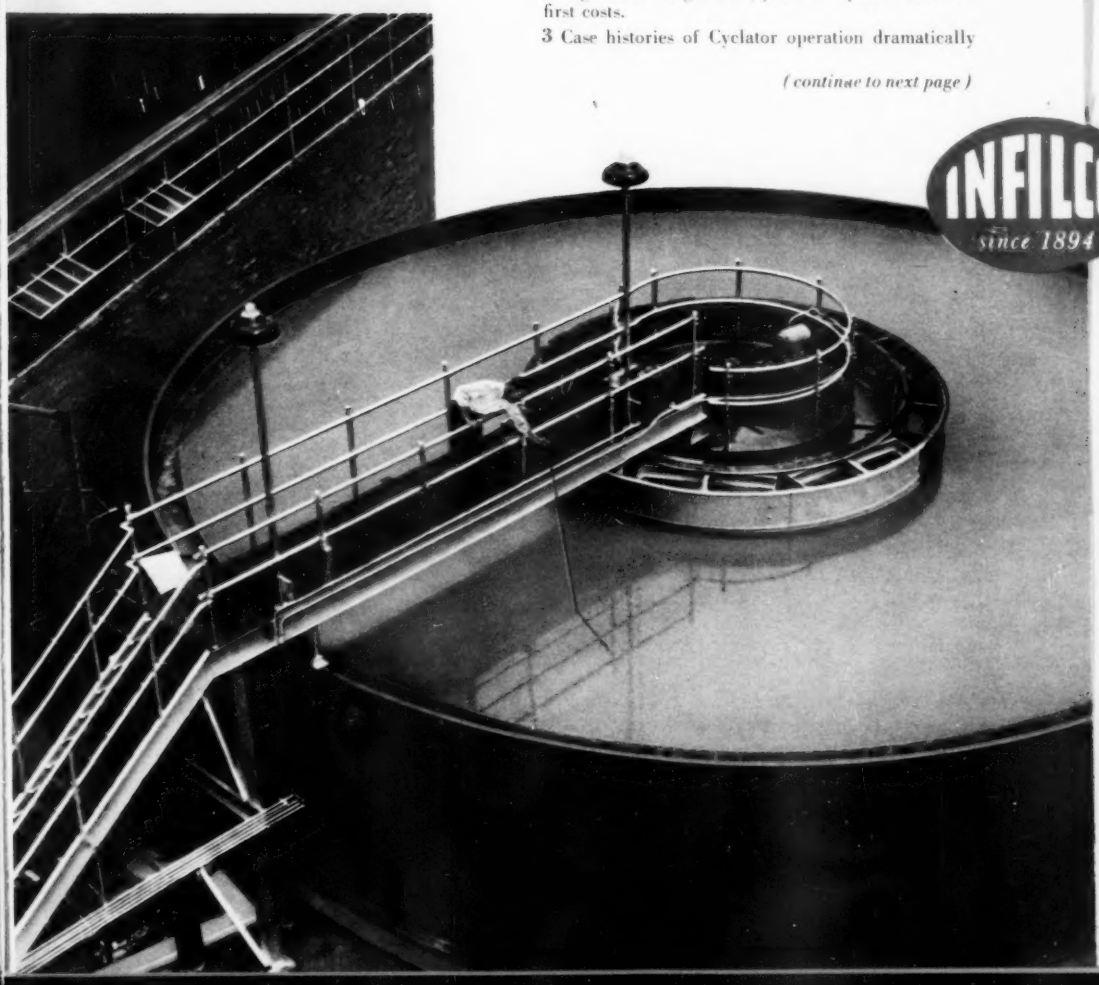
meets disposal requirements best...

1 Because the Cyclator combines recirculation for more complete clarification and faster settling with mechanical thickening for maximum sludge compaction... you gain greatest B.O.D., oil and suspended solids reduction at considerably higher flow rates than in "old style" disposal plants.

2 Because the Cyclator increases purification rates and eliminates the need for large chemical mixing, coagulating and settling basins, you save space... save on first costs.

3 Case histories of Cyclator operation dramatically

(continue to next page)



INFILCO
since 1894

(continued from preceding page)

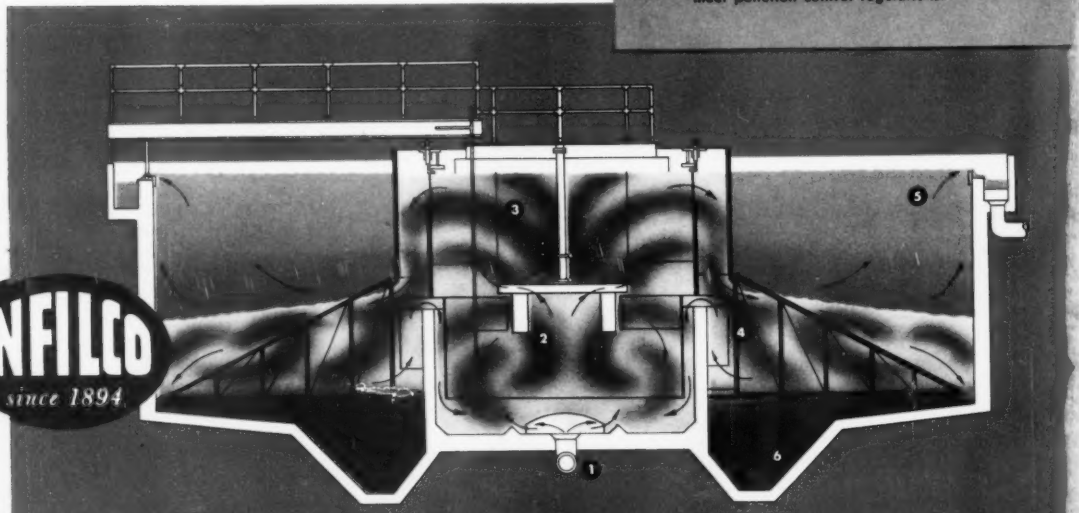
illustrate the vital point that the Cyclator will clarify wastes to your local requirements at least cost. Write for Bulletin 850A — containing data and case histories which show how the Cyclator exceeds expectations for processors everywhere — North America, South America, Europe.

INFILCO INC. ★ *Tucson, Arizona*

Here's how the Cyclator EXCEEDS waste disposal requirements

- ★ Space-savings up to 80% in comparison to "old-style" treatment plants.
- ★ By-product recovery and water re-use pay for Cyclator operation in many cases.
- ★ Removes suspended and colloidal solids, oils and toxic compounds rapidly and efficiently.
- ★ Throughput is extremely high because chemical feeding, recirculation and mechanical thickening are perfectly balanced in a single basin.
- ★ Reduces chemical costs because most efficient mixing is attained with recirculation.
- ★ Effluent purified to the degree required to meet pollution control regulations.

INFILCO *since 1894*



"EXPLAIN-MORE" DIAGRAM

1. [illegible]
2. Mixing & Coagulating Zone
3. Circulating Zone
4. Settling Zone
5. Clarified Liquid
6. Sludge Sump

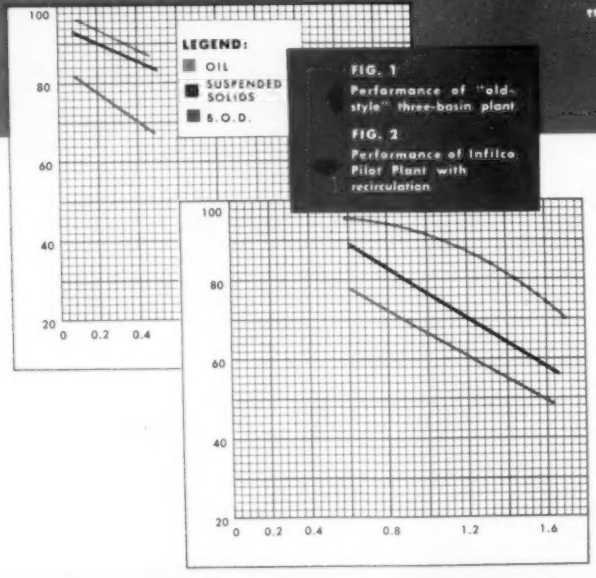


FIG. 1
Performance of "old-style" three-basin plant

FIG. 2
Performance of Infilco Pilot Plant with recirculation

TAKE A LOOK AT PROCESS SAVINGS—

Here's a recent pilot plant study. An Infilco pilot plant was installed in parallel with a treatment plant with separate mixing, flocculating and sedimentation basins.

Both plants treated oil-bearing wastes. Alum and activated silica were used as the coagulants. Figure 1 shows that the three-basin plant operated at a rise rate of only 0.2 gpm per square foot for about 95% oil removal. Slightly higher removal was gained with the Infilco plant and at a rise rate of 0.6 gpm!

The result: two 100-foot diameter Cyclators were installed by a large Eastern refinery to treat waste at 3700 gpm. Process savings like this are typical of Cyclator installations. When you need facts for waste disposal at least cost, ask for Infilco's specialized experience . . . there's no obligation for preliminary planning.

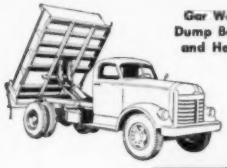
a HEAVIER refuse load
a LIGHTER budget load

Gar Wood LOAD-PACKERS
feature Hydraulic Compression

Because the Gar Wood Load-Packer collects a bigger, heavier load of refuse each trip, fewer trips are needed for your entire refuse collection. Add to this the very low maintenance and operating cost of the Load-Packer . . . the result is a substantial saving in your collection budget.

Hydraulic packing makes the Load-Packer hold far more. The low loading hopper makes loading quick and easy, avoids spillage. The tightly closed body eliminates odor and fly nuisance. More than 1600 users (from the largest cities to small towns) have cut their refuse collection costs . . . and are doing a cleaner, more sanitary job with Gar Wood Load-Packers.

Use the coupon below to learn how collection costs are slashed . . . public health improved. Write now!



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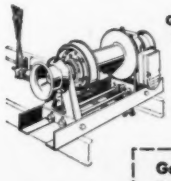

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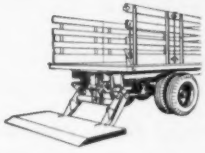

Gar Wood Elevating End-Gate

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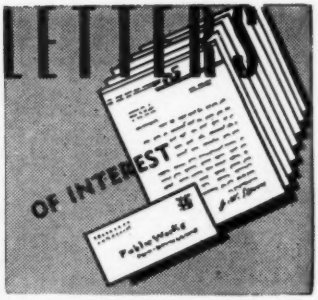

GRACIAS SENOR

Tenemos mucho gusto en comunicarles que en el No. 38 de nuestra revista "INFORMES DE LA CONSTRUCCION", ha sido publicado un complemento de artículo de esa Editorial, titulado "*El nuevo Aeropuerto de Filadelfia*": Adjunto les remitimos 1 copia del mismo, a fin de que puedan examinarlo.

Les agradecemos mucho la fotografía prestada y deseamos que dicha publicación sea del agrado de Vds.

Les saludamos atentamente.

J. A. de Guezala,
Instituto Tecnico de la Construccion del Cemento,
Madrid, Spain.

BOOKS IN BRIEF

INDUSTRIAL WASTE TREATMENT

This book, by a capable and distinguished author, describes available methods of waste disposal, the equipment and devices for analyzing and solving industrial waste problems, and provides data for design. Included are such topics as the need for cooperation and understanding; typical charges by municipal systems for handling wastes; formation of districts; the possibility of reusing wastes, and their recovery value; and a summary of all Federal and state laws on industrial waste treatment. By Edmund B. Besselievre. 365 pages; ill.; McGraw-Hill Book Co., 330 W. 42nd St., New York. $7.

FROST ACTION IN ROADS & AIRFIELDS

A review of the literature on frost action as it affects roads and airfields has been issued as Special Report No. 1, Highway Research

"Quick Change Artist"

...that saves *Your* time and money!

It's an OLIVER Wheel Tractor
and Strait-Line Loader . . .
BUT,
push this
little lever . . .
and you have a wheel-dozer
that can really move dirt

Now, it's an Oliver Wheel Tractor and *Strait-Line* Loader. But, push a little lever and *presto* . . . it's the most amazing bulldozer or angledozer you've ever seen.

You undoubtedly know the advantages of the Strait-Line Loader . . . the loader that digs in back, swings its load overhead, and loads in front. You know that the rear-carried bucket load multiplies traction . . . makes steering easy.

But now, you can get a "quick change" bulldozer and angledozer blade for the Strait-Line. Just push the little lever and, quick as a flash, you switch from loading to dozing. Pull the lever . . . you're ready for loading. Remember, by carrying the loaded bucket in the rear, you get unparalleled traction that puts real "push" behind the blade. It makes wheel tractor dozing a reality! You can load trucks without dismounting the blade.

For informative literature see your Oliver Industrial Distributor or mail the coupon.

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Industrial Division: 19300 Euclid Ave.,
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A complete line of industrial wheel and crawler tractors

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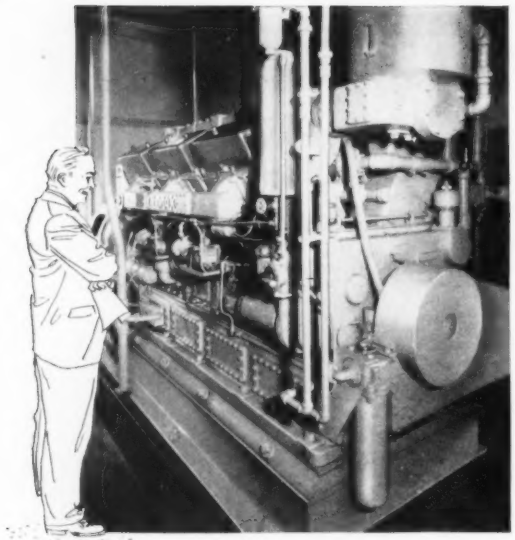

Climax V-17, 250 KVA, 440 Volt Standby Generator Set

A climax BLUE STREAK ENGINE PROTECTS BALTIMORE

The new sewage lift station in Baltimore, Md.

In the new Brooklyn sewage lift station a Climax gasoline engine driven generator stands ready to automatically and immediately take over the entire load when normal power fails.

As a result of its dependable performance three similar units are being installed in the Dundalk pumping station which is under construction.

Climax engines are custom built to specifications to assure maximum dependability and continuous operation. Sizes for standby service– 75 to 600 H.P. Low speed sewage gas engines are built in sizes– 50 to 250 H.P.

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Climax Engine & Pump Mfg., Co.,
208 S. La Salle Street, Chicago 4, Illinois

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Factory and General Office: Clinton, Iowa
Regional Offices: Chicago, Ill., Dallas, Texas

Board. It covers articles from 1765 to 1951. It does not merely list the articles; it discusses them under a number of appropriate headings. Including the index, there are 287 pages, the same size as this one you are reading. It sells for $3 per copy. Address the Highway Research Board, 2101 Constitution Ave., N. W., Washington 25, D. C.

TOOL STEELS

The "Tool Steel Handbook" is a 197-page publication of Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. Charts and tables give specific and comparative data on properties, analyses and applications. Detailed descriptions are given of all important grades of steel; heat treating and handling techniques; weight tables; and lots of other material. If you have a real need for such a book, write Allegheny Ludlum.

CIVIL ENGINEERING REFERENCE BOOK

This is a most valuable and imposing book; and for the man whose library will be limited, should be invaluable. It contains 48 chapters, each written by a recognized expert in the field. The fundamental theories and principles are stated clearly and concisely, with many worked-out examples, which should be most helpful to many engineers, especially those who are engaged in far-away places. Comprehensive mathematical, conversion and general tables are provided. There are 1,657 pages, at least 81 tables and many figures. This is a British book and its treatment is from the British viewpoint. The editors are E. H. Probst and J. Comrie. The price is $22. Copies are obtainable from Butterworth & Co., Ltd., 1367 Danforth Ave., Toronto 6, Canada, or from Butterworths Scientific Publications, Bell Yard, Temple Bar, London, W. C. 2.

BITUMINOUS ANALYSES

A quick method of analyzing bituminous road materials is described in Road Note No. 10 of the Department of Scientific and Industrial Research, Road Research Laboratory, Hammondsworth, Middlesex, England. It costs 30 cents. The method described in this paper enables the tar or asphalt content of a bituminous road mixture to be determined in from 30 minutes to 2 hours, depending on the type of mix.

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A 2½% spray is effective.

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NEW LISTINGS

Make Your Own Concrete Pipe For Sewers and Culverts

65. Machinery for making concrete pipe for sewers and culverts, both plain and reinforced, sizes 4" to 36", is described in bulletins of the Concrete Pipe Machinery Co., Sioux City 17, Iowa. Either bell and spigot or tongue and groove can be used. Get full details by using the coupon.

Vibrating Screen Attaches To Your Loader

119. A vibrating screen which may be attached to any conveyor or bucket loader to discharge directly into a truck is available from Kolman Mfg. Co., 4700 West 12th St., Sioux Falls, S. D. This screen features a parapolic deck which spreads material to utilize full screen area. Complete details available by checking the coupon.

Design Data for the Spiraflo Clarifier

124. Be sure to investigate the advantages of the Spiraflo clarifier for sewage treatment. Full engineering data, description of the unit, test results and specifications are offered in 24-page Bulletin 122 by Lakeside Engineering Corp., 222 W. Adams St., Chicago, Ill. Check the coupon today.

What's Your Traffic Problem?

127. Traffic signals and controllers of every type are offered by Eagle Signal Corp., Moline, Ill. You will find a great deal of helpful data and diagrams of typical installations in Bulletins A 10 and C 10, available by checking the coupon.

What You Should Know About Design of Gravity Filters

190. Complete design data on gravity filters and details of all filter accessories will be found in a comprehensive 24-page booklet prepared by the Permutit Co., 330 West 42nd St., New York 18, N. Y. Every engineer dealing with water problems should have a copy of this authoritative reference. Check the coupon for yours.

Helpful Data On Pipe Repairs

196. CirclSeal clamps for repair of breaks, leaks or corroded areas in all types of service pipe are described in bulletins issued by R. H. Baker & Co., Inc., 2070 E. Slauson Ave., Huntington Park, Calif. Check the coupon for a copy.

Relugging Tires For Tractors and Graders

202. Tires that have lost tractive power through wear can be relugged in any design by the Vacu-Lug method, which permanently welds lugs to the worn tire. You can get full data on this faster method of tire maintenance from American Tire Machinery, Inc., 718 So. Elliott St., Muncie, Ind. Use the coupon.

Have You Investigated Pneumatic Conveyor Systems?

203. Bulk handling of chemicals at water and sewage treatment plants can be made cheaper and easier with pneumatic conveyor systems. For details on the Dracco Airstream system, with diagrams of basic conveyor types and applications at municipal plants get Bulletin 529 from Dracco Corp., Cleveland 5, Ohio. Check the coupon today.

Data Offered On Long-Lasting Strainers

204. Data on gravity and suction strainers, designed to provide generous ratios of open area to pipe size, are available from Rife Hydraulic Engine Mfg. Co., 30 Church St. Annex, New York 7, N. Y. Check the coupon for full information.

Get This Manual On Protective Coatings

184. In the comprehensive 54-page catalog issued by the Tnemec Co., Inc., No. Kansas City 16, Mo., you will find detailed information on preservative and decorative coatings for every maintenance requirement, including gas and fume-proof coatings for sewage plants and rust preventative primers and finish coats for tanks, bridges and all steel surfaces. Get Catalog No. 50 for a handy reference on every paint and painting need. Check the coupon.

Pressure Reducing Regulator Has High Inlet-to-Outlet Ratio

172. Get full data on the new 50-G2 pressure reducing regulator that permits inlet-to-outlet rations of 250 to 2 lbs. at accuracies approaching instrument control. Bulletin G-101, availabe from Foster Engineering Co., 825 Lehigh Ave., Union, N. J. gives full details. Check the coupon.

Helpful Pumping Manual Gives Engineering Data

78. Twenty-four pages of helpful engineering data and hydraulic tables will be found in the "Pumping Manual", Bulletin 2910 compiled by the Pacific Pumping Co., 9210 San Leandro St., Oakland 3, Calif. Included are tables on costs, motors, and wiring in addition to general pumping information. Check coupon for a copy.

PEST CONTROL

Investigate "Tifa" For Insect Control

116. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals are distributed as a true, clean fog. Use coupon for full data on public health programs. Combustion Equipment Div., Todd Shipyards Corp., 81-16 45th Ave., Elmhurst, N. Y.

MORE LISTINGS ON PAGES 28 TO 38

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When you're competing with all other sweeping methods and equipment on a "per hour" rate, the costs of operation are doubly important. Bill Heath of Inglewood, California, sweeps on contract for paving contractors, municipalities and industrial plants. He has owned and operated nearly every type of sweeper in recent years and he says—"Mobil-Sweeper is the best machine I've ever had. Speed in traveling to and from the sweeping area is vitally important in my cost records. Mobil-Sweeper is outstanding in this department.

"Maintenance costs have been unbelievably low. That International engine is great—the sweeper design is properly engineered. Gutter broom and rear broom are easy to adjust, and I get long wear on both. The dirt hopper always fills to capacity—something I check because it costs me money to stop too often. For my money—and I do mean my money—Mobil-Sweeper is the best buy on the market!"

Write today for literature telling how you can cut your sweeping costs.

TWO GUTTER BROOM MODEL WITH DUAL DRIVING CONTROLS

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PW18

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Please send catalog with complete details and specifications for the Mobil-Sweeper.

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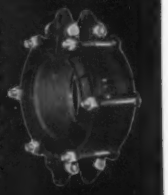
SKINNER-SEAL
Bell Joint Clamp for stopping bell and spigot joint leaks under pressure. Gasket is completely sealed: at bell face by Monel Metal Seal band—at spigot by hard vulcanized gasket tip.

AND BROKEN MAINS

SKINNER-SEAL
Split Coupling Clamp. One man can install in 5 to 15 minutes. Gasket sealed by Monel band. Tested to 800 lbs. line pressure. A lasting repair. 2" to 16" incl.



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SOUTH BEND 21, INDIANA, U.S.A.

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FOR BLACKTOP

SEE . . . . . .
how Bituminous Surfaces are Improved & protected with
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Seal-coat Pioneers — Engineers and Distributors
2157 S. Park Ave. Buffalo 20, N. Y.

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On Effective Insecticides

190. Complete information on proper application and formulations of Chlordane and other effective insecticides for fly and mosquito control is available from the Velsicol Corp., 330 E. Grand Ave., Chicago 11, Ill.

Effective Rat Control
For Dumps

263. Rat infestations in public dumps can be effectively controlled with the weatherproof steel "Rat Cafeteria" offered by Solvit Chemical Co., Inc., Speedway Road, Madison 5, Wis. Warfarin and bait are kept available for continuous feeding without wastage. Check coupon for full details.

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STREETS AND HIGHWAYS

How the Mobil-Sweeper
Can Improve Street Sweeping

23. Sweeping costs can be cut with the new Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to The Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use coupon for complete details on this machine.

Do You Have Complete
Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use coupon for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

How to Beat
The Weed Problem

66. Be sure to investigate weed control with selective chemical weed killers that get roots and all. Send in coupon today for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Clean Cuts For
Concrete and Blacktop

98. Quick, efficient cuts in pavement for repair and installation of underground utilities are easily made with the Tri-Line concrete cutter. Smooth clean edges of cuts prevents spalling of the replaced pavement. For all details on the Tri-Line cutter and double-bonded diamond blades get form 500A from Tri-Line Co., 921 Carroll St., Racine, Wis. Just check the coupon.

Rubber Traffic Cones for
Safe Traffic Barricades

105. Safe and convenient traffic barricades can be placed quickly when you use the inexpensive rubber Traffic Cone. Flexible, wear-resistant cones are easily attached. Cones are Square-based for stability and brilliantly colored for visibility. Full details from Safety Traffic Cone Corp., 949 No. Vignes, Los Angeles 12, Calif. by checking the coupon.

Reference Manual on
Guardrail Design

114. Here is an interesting and informative booklet in which all factors influencing guardrail design are outlined, and safety and economy discussed in detail. Eight pages are devoted to basic design data, with handy tables covering physical properties, tensile and beam strengths, deflection and other data. Write Armco Drainage and Metal Products, Inc., Dept., PW, Middletown, Ohio.

How to Save Time on
Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept., PW, Warren, Ohio.

Uniform Salt Spreading
Saves Material

145. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Black-Top Paver
Offers Many Advantages

150. The flexible Adnun Black Top Paver lays any asphalt mix, hot or cold, in widths from 6 ft. to 13 ft. Careful design lowers operating cost and cuts maintenance. Attachments spread stone, cinders or slag. Get full data on this machine by checking coupon. The Foote Co., 1954 State St., Nunda, N. Y.

Your Property is Worth
Good Protection

176. When installing link fence you want protection against rust and corrosion as well as vandalism. Investigate chain link fence made of "Konik" metal described in "Planned Protection" published by Continental Steel Corp., Kokomo, Ind.

Valuable Booklet
Tells Soil Stabilization Facts

206. All forms of soil stabilization, using any type of binder with any suitable aggregate, are covered in "Soil Stabilization Methods," Bulletin 25 published by Seaman Motors, Inc., Milwaukee 3, Wis. Get this valuable booklet for complete information on processing methods and the many uses of the Seaman Pulvi-Mixer by checking the coupon.

Investigate "Super Seal"
For Blacktop Surfaces

222. Appearance and wearing qualities of all black-top surfaces may be improved with an application of Super Seal", a weather and solvent-proof emulsion with a coal tar base. Be sure to investigate this easily-applied material that puts a smooth, tough finish on pavements and parking areas. Full details from Troyer Driveway Service, 2157 South Park Ave., Buffalo 20, N. Y. Check the handy coupon.

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CONSTRUCTION EQUIPMENT AND MATERIALS

Your Dump Truck
As a Complete Working Unit

39. The addition of a Holmes-Owen Loader to four dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

Handbook of Contractors Pumps
Is Easy to Use

49. Big 50-page Catalog P-10 covers dewatering pumps, pressure pumps, well point systems and electric pumps, and also features a special section of useful data which helps in the selection of the right pump for your job. Every construction engineer and contractor should have a copy of this valuable handbook. Just check the coupon. The Jaeger Machine Co., 400 Dublin Ave., Columbus 16, Ohio.

How to Keep Your Loader
On the Job

50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Dept. PW, Galion, Ohio.

Municipalities Make Equipment
Dollars Go Further

55. Be sure to get your copy of "Saving Facts" a new illustrated booklet prepared by The Oliver Corp. that shows how equipment dollars can be stretched on municipal work. Text and photos describe the application of tractors

and money-saving attachments in street maintenance, snow removal, waste disposal, pipe laying and other projects. Write The Oliver Corp., Industrial Div., 19300 Euclid Ave., Cleveland 17, Ohio, or check coupon.

Excellent Booklet Shows Aerial Mapping Technique

27. A clear explanation of the technique of aerial topographic map production is given in "Air Speeds Your Map Needs." Striking photographs trace aerial photos step-by-step to the final maps for highway location, city and regional zoning and planning, traffic studies, drainage and watershed projects, tax maps and many other types of work. Use the coupon to get this excellent booklet for public works and planning officials. Jack Ammann Photogrammetric Engineers, 829 N. St. Mary's St., San Antonio 2, Texas.

New Portable Roller Performs Many Jobs

60. An attractive four-color catalog No. 350 presenting their new portable roller is available from The Galion Iron Works and Mfg. Co., Galion, Ohio. Construction and operation features include: hydraulic steering, constant mesh transmission, spur gear final drive, variable weight compression roll and towing hitch with built-in hydraulic jack. Use the handy coupon for your copy.

Examining a Tractor Piece by Piece

99. The new 32-page catalog published by International Harvester Company should be studied by every tractor owner, for in it each unit from engine to track of the TD-9 Diesel is considered separately. These piece by piece discussions are supplemented by notes on easy servicing, versatile applications and attachments for every need. Get your copy of form CR-313-A from International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., or check the handy coupon.

Helpful Booklet on Carryable Centrifugal Pumps

129. A booklet prepared to give practical information that will guide you in choosing the best type of pump for your requirements is offered by the Homelite Corp. Both gasoline and electric models are discussed, and requirements outlined for many applications. Just check the coupon for your copy. The Homelite Corp., 2125 Riverdale Ave., Port Chester, N. Y.

Air Cooled Engines for Hundreds of Applications

137. Tested under severest conditions of long, hard use, these engines have earned world wide recognition as the "right" power of hundreds of applications. Get latest bulletin from Dept. PW, Briggs and Stratton Corp., Milwaukee 1, Wisc.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

Profitable Construction with Payloader

234. A comprehensive, 12-page catalog filled with on-the-job photos showing a wide variety of earth-moving, material-handling, lifting and carrying jobs being performed by the multi-purpose tractor-shovels known as "Payloaders" is now available. Helpful job data, specifications and features of the complete Payloader line are included, with illustrations of useful accessories. Copies of this colorful catalog No. 217 can be obtained from The Frank G. Hough Co., 761 Sunnyside Ave., Libertyville, Ill., or by checking the coupon.

Choosing Trucks For Municipal Service

264. For all municipal services, trucks are needed that are high in efficiency and economy. Be sure to investigate the White 3000, engineered for high performance. Full details on White Super Power trucks from the White Motor Company, Cleveland 1, Ohio.

Surveying Instruments— Basic Tools for the Engineer

228. Be sure you get Bulletin 1052 of David White Co. when you need transits, levels and other top-quality surveyors gear. A full line of surveying instruments and accessories is described in their 42-page catalog. Get your copy by checking the coupon or write to David White Co., 315 W. Court St., Milwaukee 12, Wis.

Gunite Costs Less On Repair Jobs

255. Be sure to investigate Gunite for repair of reservoirs, dams, water and sewage plant tanks, sewers, swimming pools, etc. Contact Eastern Gunite Co., Elkins Park, Pa. for full information, or use coupon.

Design Data on Universal Concrete Cribbing

274. Complete information on concrete cribbing for embankment retaining walls, bridge abutments, highway underpasses and other structures will be found in a new bulletin issued by the Universal Concrete Pipe Co., 297 S. High St., Columbus, Ohio. Check coupon for free copy.

POWER AND LIGHT

Gas-Diesel Engines for Low Cost Municipal Power

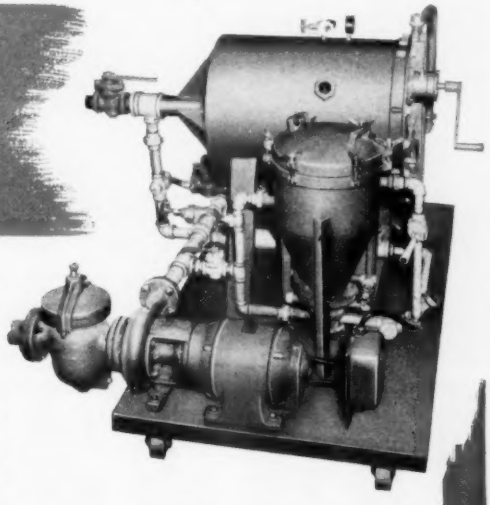
283. Be sure to get the latest catalogs on Cooper-Bessemer gas-diesel engines for dependable, low cost electric power in your city. Full details are available by writing to the Cooper-Bessemer Corp., Mt. Vernon, Ohio, or just check the handy coupon.

(*Continued on page 32*)

PLANNED PROTECTION FOR WATER SYSTEMS

SPARKLER FILTERS

. . . ideal for mobile applications



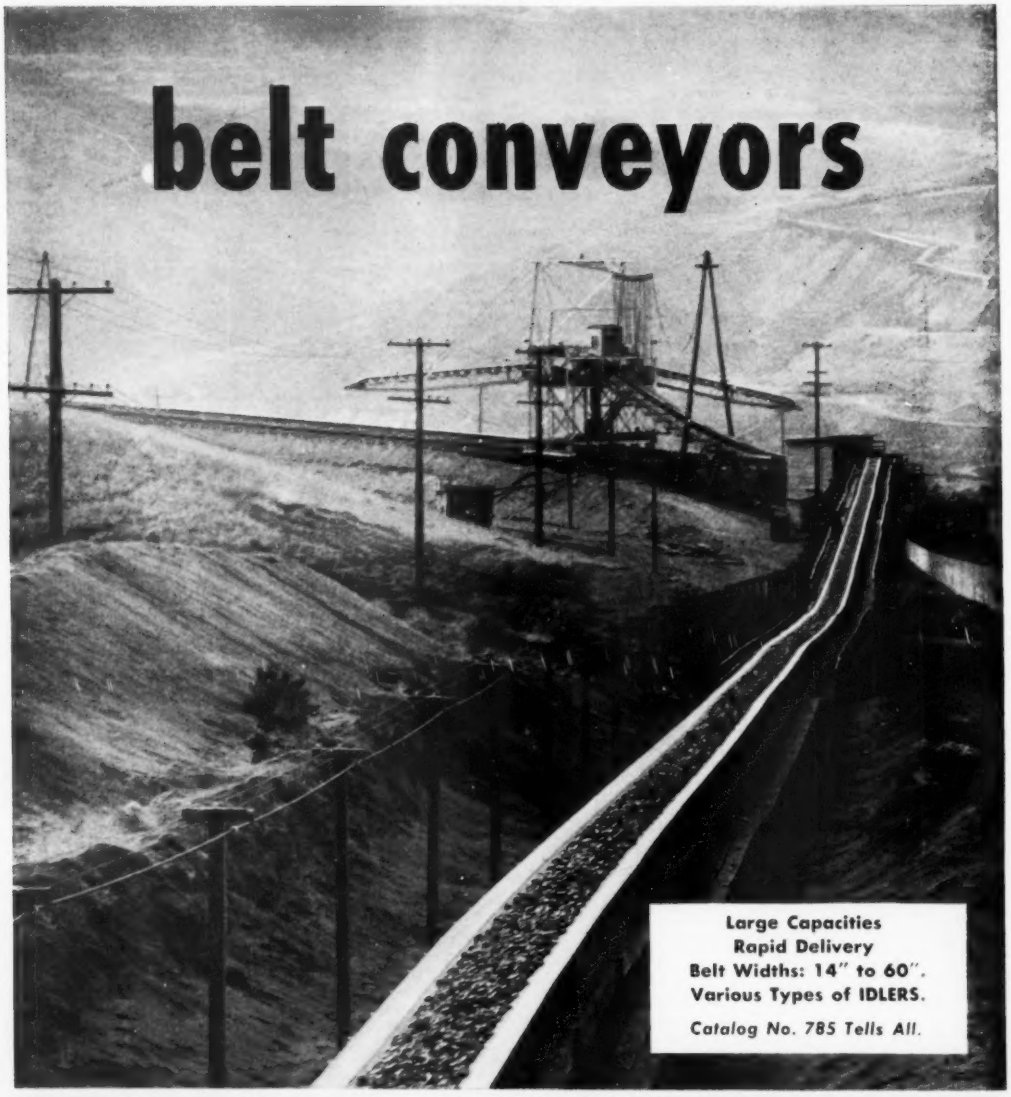
Contamination or failure of municipal water systems is probably the most serious threat to the survival of a community in the event of disaster. With Sparkler mobile filtration systems, however, every community is assured an adequate supply of safe, pure drinking water.

Sparkler Model SC diatomite filters are designed to filter large quantities of water quickly and effectively—at low cost. They are self-cleaning, and do not need to be broken down for either cleaning or inspection. The entire cleaning and pre-coating operation can be accomplished in 15-20 minutes so that the filter is hardly out of service.

Complete units, including filter, pump, slurry feeder, debris catcher, chlorinator, and gasoline engine can be furnished ready for mounting on truck or trailer bed. Filters are available with rated capacities ranging from 900 GPH to 72,000 GPH. These standard sizes, however, can deliver far greater quantities of water when necessary, although this is not recommended for general service. Write for literature.

Other units, designed for manual portability, may be supplied. Our Engineering Service is available for special design work or for modifications of standard models.

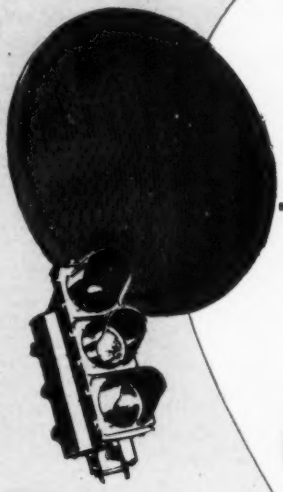
SPARKLER MANUFACTURING CO., Mondelein, Illinois



THE JEFFREY MANUFACTURING COMPANY
947 North Fourth St., Columbus 16, Ohio

1877 75 1952

Need more facts about advertised products? Mail your Readers' Service card now.

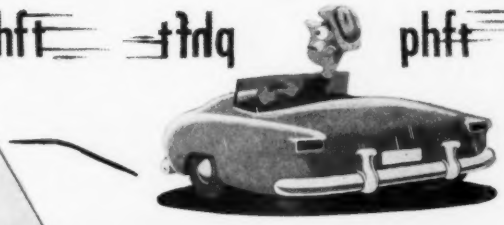


. . . . . a welcome sight

When traffic comes and
traffic goes,

And keeps on whizzing
past your nose,

phft ttdq phft



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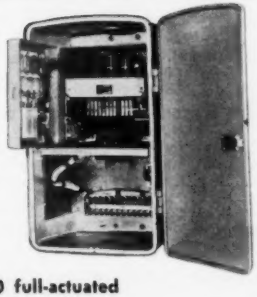
CONTROLLERS

Eagle Traffic Actuated Controllers will very effectively solve the problems of infrequently used cross streets. Actuated Controllers insure constant traffic flow with the least amount of lost time to the main street traffic. Eagle builds a complete line of pedestrian and vehicle actuated controllers to meet your every requirement. Write Eagle today and ask for Bulletin F10. Let Eagle experts aid in solving your traffic problems.

EAGLE SIGNAL
CORPORATION Moline, Illinois



The ET50 full-actuated electronic controller.

(*Continued from page 29*)

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, % Editor, Public Works, 310 E. 45th St., New York 17, N. Y. Check the coupon and we will forward your request.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass.

A Handbook of Sewer Cleaning Equipment and Methods

46. A new, fully illustrated 40-page booklet shows every sewer cleaning operation with "Flexible" tools. Includes data on the fast and easily operated new SewerRodeR and full engineers' specifications for power bucket machines. For your copy write Flexible Sewer Rod Equipment Co., 9059 Venice Blvd., Los Angeles 34, Calif.

Valuable Booklet on Porous Diffuser Plates and Tubes

21. A helpful 20-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in activated sludge plants. Full data for the designing engineer is provided by careful detailing of physical characteristics of plates and tubes. Maintenance of porous media also is discussed at some length. For your copy of Form 1246, write to the Norton Co., Dept. PW, Worcester 6, Mass., or use the coupon.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

End Root Problems With Root-Proof Sewers

107. Troubles caused by roots and corrosions in house connections can be eliminated by the use of root-proof Bermico sewer pipe. Full details on this smooth, waterproof, tight-sealing pipe available by checking the coupon, or write to the Brown Co. Dept. PW, 150 Causeway St., Boston 14, Mass.

What Bonded Performance Can Do For You

121. On every construction job your city or county should be protected from a contractor's default or inability to perform the work. Learn what "Bonded Performance" can do for you. Write National Surety Corp., 4 Albany St., New York, N. Y., or check the coupon for full details.

Engineering Data on Digester Heating

128. An excellent 32-page bulletin covering all features of the PFT External Heater and Heat Exchanger unit discusses effective digester heating, size of heater and exchanger, space requirements, building heating, and related items. Curves and tables provide full data for the designer. Requests for this comprehensive bulletin, No. 235, must be sent on business letterhead. Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

How to Dig Low Cost Trench Under All Conditions

61. The Barber-Greene Runabout ditcher features hydraulic control of crowding speed, independent of bucket line speed, to provide maximum digging efficiency under all soil conditions. One-man operation and mobility from job to job result in trenching at the lowest cost. Get Bulletin 705-A now for full details on this money-saving machine. Barber-Greene, Aurora, Ill.

High Rate Filters For Sewage Treatment

74. Accelerated biological oxidation in treatment of sewage and other organic wastes is a feature of Infilco's Accelo Filter system. Bulletin 6200 explains the direct recirculation principle, shows plant layouts, and gives performance data. For your copy write Infilco Inc., Box 5033, Tucson, Ariz., or check handy coupon.

Odorless Sanitary Septic Tank Cleaning

88. The Gorman-Rupp Odorless Sanitary Cleaning unit combines centrifugal self-priming pump, air-cooled engine and oval tank on a sturdy frame. For full description of this adaptable unit get bulletin 7-ST-11. Gorman-Rupp Co., 120 N. Bowman Ave., Mansfield, Ohio.

Get the Facts on The Contact Aeration Process

94. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

The "PELICAN" PUMP

THE WONDER PUMP OF THE

Lightweight Field

AND THE LOWEST PRICED TWO-INCH PUMP OF ITS CAPACITY ON THE MARKET!

TWO-INCH 7,500 G.P.H.

PATENT NO. 2461925

The "Pelican" self-priming centrifugal pump challenges any pump its size and type to equal it in performance.

Quickest priming, Fastest pumping, Most dependable

Suction Lift - up to 25 feet, sea level.

Automatic Self-priming - no ports, no valves.

Portability - weighs only 70 pounds, provided with carrying handle for easy portability.

Non-clogging - any muck or solids that will pass the intake strainer will pass through the pump.

Simplicity - the impeller, the only moving part, is mounted directly on the engine shaft and operates at engine speed.

The "Pelican" is a reliable, trouble-free, general utility pump small enough for easy handling and large enough for a wide range of applications in municipal utility field.

Write for bulletin No. 7-LW-13.

FOUR GORMAN-RUPP LIGHTWEIGHTS

The Midget, 1½" - wgt. 62 lbs., 5500 g.p.h. Primes in 75 sec. at 25 ft. suction lift.

The Pelican, 2" - wgt. 70 lbs., 7500 g.p.h. Primes in 75 sec. at 25 ft. suction lift.

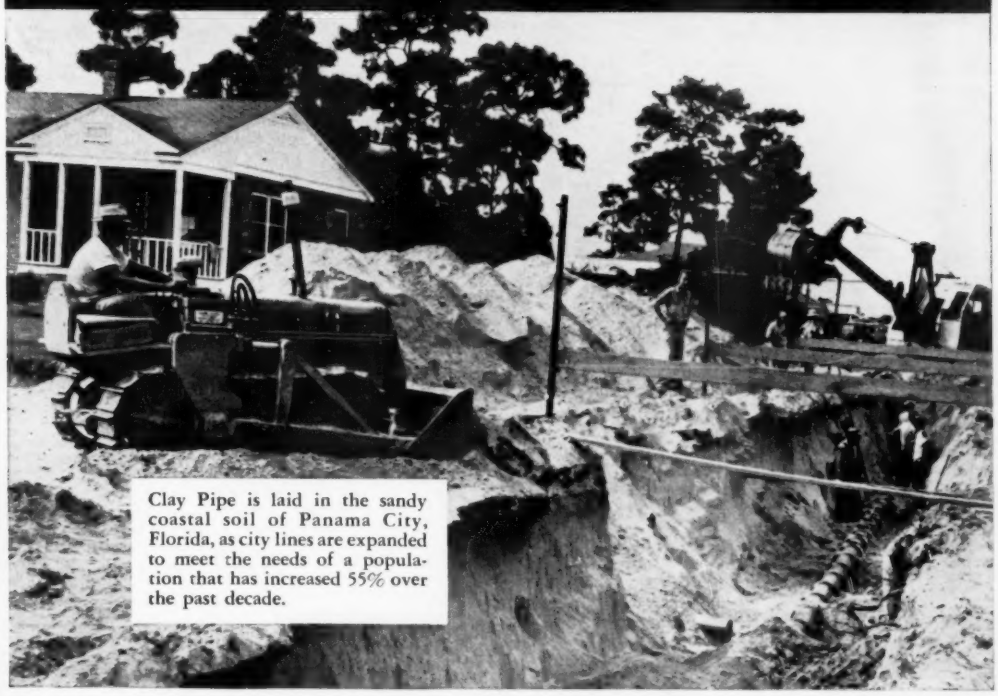
The Hawk, 2" - wgt. 110 lbs., 10,000 g.p.h. Primes in 47 sec. at 25 ft. suction lift.

The Eagle, 3" - wgt. 117 lbs., 18,000 g.p.h. Primes in 79 sec. at 25 ft. suction lift.

THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

CLAY PIPE—*ESSENTIAL • ECONOMICAL • EVERLASTING*



Clay Pipe is laid in the sandy coastal soil of Panama City, Florida, as city lines are expanded to meet the needs of a population that has increased 55% over the past decade.

Panama City installs 85 MILES of CLAY PIPE in $3.5 MILLION Sewer Expansion Program

More than 440,000 feet of newly-installed Vitrified Clay Pipe will serve defense housing and industry in Panama City, Florida. It's the *one* pipe that has proven its dependability and resistance to corrosion through *actual service in the ground.* In acid soils inland or alkaline coastal sand, Clay Pipe continues to provide the same unfailing sanitary service, year after year. It's chemically-inert — unaffected by sewage gases or electrolysis. *It never wears out!*

National Clay Pipe Manufacturers, Inc.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.

Wherever Reliable, Performance-Proved Pipe Is Needed, Specifications Call for Vitrified Clay

Tucson, Ariz. (Air Force Base)	440,000 ft.
Rapid City, S. D. (Air Force Base)	54,000 ft.
Morrisville, Pa. (New Steel Defense Plant)	300,000 ft.
Marion, N. C. (Municipal Expansion)	32,000 ft.
Limestone, Maine (Air Force Base)	65,000 ft.
Rantoul, Ill. (Chanute Field)	158,000 ft.
Bakersfield, Calif. (Air Force Base)	196,000 ft.
Orlando, Fla. (Air Force Base)	74,000 ft.

Vitrified
CLAY
CLAY PIPE NEVER WEARS OUT!
PIPE

C-652-6

To order these helpful booklets check the coupon on page 26.

Construction and Engineering Service For Water and Waste Systems

97. In addition to their nationally-known water and sewer system rehabilitation services, the Pittsburgh Pipe Cleaner Co., 133 Dahlem St., Pittsburgh 6, Pa., is now prepared to furnish complete engineering and construction service, including surveys, tests, design and construction. A full and concise description of these services will be found in an attractive new folder. Get your copy by checking coupon.

Sewer and Water Pipe Cleaning Service Can Save You Money

149. Your sewers and water pipes will be cleaned by experienced crews using modern, mobilized equipment when you take advantage of the fast, efficient service offered by Ace Pipe Cleaning Contractors, Inc., Kansas City, Mo. Don't neglect proper sewer sanitation or clogged water lines; let specialists do the job for you. Make a start today by getting the profusely illustrated bulletin which describes the Ace services. Check the coupon now.

Have You Investigated Plastic Pipe?

165. Yardley plastic pipe is available up to 6" in standard pipe sizes plus lightweight rigid and flexible types. All Yardley pipes are non-toxic and highly resistant to chemical action and corrosion. Folders describing each type are available from Yardley Plastics Co., 142 Parsons Ave., Columbus 15, Ohio.

Design Data for Insulated Piping

188. For all jobs where insulated piping is required you will want full design data on Ric-wiL Prefabricated Insulated Piping. Get 28-page catalog from the Ric-wiL Co., Cleveland, Ohio, for details on both underground and overhead lines.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use coupon or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Data Offered On Mixed Flow Pumps

201. Data on the complete line of Worthington Mixflo pumps of the two-vane, non-clogging sewage type is offered in 16-page bulletin W-317-H16. Salient features are outlined, typical sections, performance curves and general data for five types are included. Helpful charts aid shafting selection. Copies available by using coupon or from Worthington Corp., Harrison, N. J.

How to Estimate Quantity Of Joint Compound Needed

229. Directions for using Atlas G-K Sewer Joint Compound plus a handy table quantity of compound and jute required per joint of sewer pipe are presented in Bulletin M20-1. Get full data on this permanent joint material from Atlas Mineral Products Co., 10 Pine St., Mertztown, Pa., or use coupon.

Efficient Blowers for Activated Sludge Plants

232. Many advantages of Roots-Connersville positive displacement rotary blowers are described in Bulletin 22-23-B-13, which also provides characteristic curves for operation with constant speed, multi-speed and variable speed motors and details of several types of blowers. Get this helpful bulletin by checking the coupon. Roots-Connersville Blower Corp., Connersville, Ind.

Book Tells How to Control Root Stoppages

249. Details on the proven use of copper sulfate to control root and fungous growths in sewers are contained in a brand-new book published by Phelps Dodge Refining Co., 40 Wall St., New York 5, N. Y.

Design Data on the Circuline Sludge Collector

237. All the information you need for the design of circular settling tanks using the Link-Belt Circuline sludge collector will be found in 20-page Book No. 1982, published by Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa. Capacity tables, suggested sizes for all piping and design details are included. Check the coupon for your copy of this valuable booklet.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering-Superheater, Inc., Flash Dryer Div., 200 Madison Ave., New York 16, N. Y.

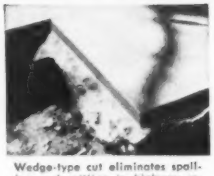
●

REFUSE COLLECTION AND DISPOSAL

Thinking of Sanitary Landfills? Get This Booklet Now

131. One of the most informative descriptions of the sanitary landfill method of garbage and refuse disposal is presented in Caterpillar's 16-page booklet "A Look to the Future with Sanitary Landfill." The booklet is designed to serve as a guide to proper site selections, the choice of the right equipment to do the job, and the actual operations of sanitary fill. Pictorial treatment shows how and when to start such a program, what to look for in a site, benefits received by the community, and other important considerations. Published by the Caterpillar Tractor Co., Peoria 8, Ill. Check the coupon for your copy.

COMPARE THESE *Tri-Line* FEATURES BEFORE YOU BUY ANY CONCRETE SAW!



Wedge-type cut eliminates spalling and settling in highway repair and underground services.

Cutting provides superior contraction joints at lower cost . . . permits laying concrete in long sections without interruption.

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Bulletin Helps Pump Installation Design

103. Construction details, design, approximate dimensions and typical examples of performance of Economy double-suction centrifugal pumps will be found in 16-page Catalog A750, issued by Economy Pumps, Inc., Div. of C. H. Wheeler Mfg. Co., 19th and Lehigh, Philadelphia 32, Pa. This bulletin is profusely illustrated to show many types of pumps and methods of drive for water works service. Check coupon for your copy.

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Helpful Data on Mechanical Joints

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Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Helpful Book Gives Pipe Flow

159. This handy 40-page pocket size book titled "Measurement of Water Flow Through Pipe Orifice with Free Discharge" explains the Layne pipe orifice meter method of computing water flow. Includes flow graphs for various size pipes. Layne & Bowler, Inc., Box 215, Hollywood Station, Memphis 8, Tenn.

Helpful Data on Corporation Stops

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166. Complete details on all equipment and proper methods for meter testing and installation are included in an excellent book published by Ford Meter Box Co., Wabash, Ind. All waterworks men concerned with setting and testing of water meters should have a copy of this book. Write for Catalog No. 50.

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186. A 16-page booklet tells how to use the Fisher "M-Scope" to locate buried pipes and valves by electronic means. Proper manipulation also determines depth of cover. Battery operated unit is readily carried by one man. Get data from Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.

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Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5002 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the coupon for your copy.

New "Chromatron" Photoelectric Colorimeter and Turbidimeter

251. The Hellige "Chromatron" features selective color filters, square and round absorption tubes, hermetically sea'ed photocell and automatically focused bulb to permit analysis of water and sewage using Standard Methods or any other colorimetric procedure. Full information from Hellige, Inc., 877 Stewart Ave., Garden City, N. Y.

Attractive Bulletin Features Large Elevated Tanks

252. In a new 24-page booklet, "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Hortonspheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check coupon for your copy.

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256. Civilian government employees are offered insurance protection at the lowest possible cost by Government Employees Insurance Companies, Gov't Employees Insurance Bldg., Washington 5, D. C. Full details available by checking the coupon.

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General Catalog on Measuring and Controlling Equipment

272. The full line of Simplex equipment for the measurement and control of liquids and gases in water and sewage plant installations is illustrated and described in detail in 28-page Catalog 002. Every engineer should study the design data in this helpful booklet. Write Simplex Valve & Meter Co., 68th & Uplands Sts., Philadelphia 42, Pa., or use the coupon.

Book Tells How to Control Algae

257. A booklet giving details on the control of various microscopic organisms frequently found in water supplies is offered by Phelps Dodge Refining Co., Dept. PW, 40 Wall St., New York 5, N. Y. Check coupon for your copy.

All About Centrifugal Pumps

258. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use coupon or write to Fairbanks, Morse & Co., Dept. PW, Chicago 5, Ill.

Gauges for Good Filter Plant Operation

275. Mechanically operated filter gauges for indicating and recording loss of head, rate of flow, sand expansion and other data needed for good filter plant operation, are described in Bulletin No. 450-H10, issued by Builders-Providence, 356 Harris Ave., Providence 1, R. I. Besides details on the gauges themselves, typical installations are shown. Check coupon for your copy.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in a convenient booklet offered with the compliments of U. S. Pipe and Foundry Co., Burlington, N. J. Get your copy by checking the coupon.

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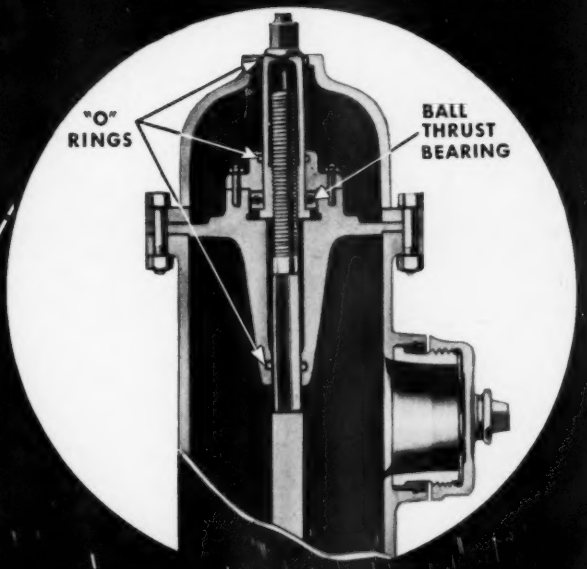

Photo above shows modern, clean-cut design of new Darling B-50-B fire hydrant. As in any Darling hydrant all *inside working parts, including main valve and drain valve parts, can be removed through the top for easy inspection and simplified maintenance.*

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Before you decide on *any* hydrant, be sure to weigh *all* the advantages of Darling's B-50-B hydrant.

Send for Bulletin No. 5007

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For example, since Thomas Edison invented the incandescent filament lamp in 1880, the electric light industry has grown to an annual volume of $501,500,000 in light bulbs alone; in May, 1906 the Wright Brothers received the patent for their flying machine; the value of aviation manufactures in 1951 in the United States alone was estimated at $3,350,000,000 and in February, 1952, records show a $10½ billion backlog of orders.

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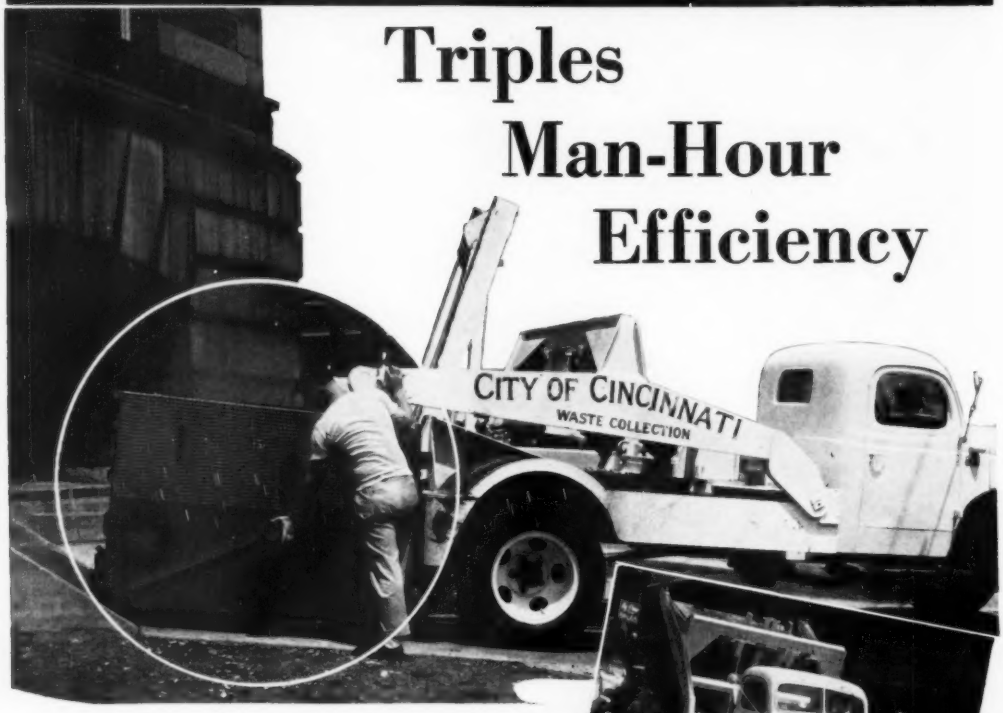

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Photos above show the Dempster-Dumpster System at work in Cincinnati, picking up, hauling and the start of dumping the bulky load from one of their 6 cu. yd. containers.

DEMPSTER BROTHERS, 972 Dempster Building, Knoxville 17, Tennessee

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PUBLIC WORKS Magazine

Vol. 83 • No. 6 July, 1952

How FLORIDA improves SUBSTANDARD ROADS

C. E. WRIGHT

OF approximately $75,000,000 that will be spent by the State Road Department on Florida highways this year, a large portion will be devoted to bringing sub-standard roads up to standard, mainly by widening and resurfacing, and a minor portion will be expended on new highways.

The State Road Department's 1952 budget totals about $186,000,000, but this includes some projects which are carried over from 1951 and others which are wholly or partly covered by bond issues such as the $50,000,000 Jacksonville project, the $22,000,000 Tampa Bay bridge, and tunnels and bridges in Broward County near Fort Lauderdale. Also, projects have been put into this year's budget for which funds will not be available in order to allow flexibility in selecting projects for which materials will be available.

Road widening has become a "must" because many sections of primary highways built back in the 1920s are only 18 or 20 ft. wide and are hazardous under present traffic conditions. Some large trucks have a width of 8 ft. so that, in passing, there is a leeway, in some cases, of only 2 ft. Such sub-standard roads will be brought up to 24 ft. as rapidly as funds are available. Attention will be centered on primary roads, although some secondary roads will also be widened where the traffic warrants.

The Florida State Road Department has learned some lessons about road widening the hard way. Some of the work that has been done in the past has not stood up. Where widening strips were added to concrete-based highways, a flexible base was used for the strips, with the result that the strips have been beaten down and pushed out so that in many places they are one to two inches below the old concrete portion of the road. The drop-off the old pavement and the sunken strips creates a dangerous condition for even moderately traveling automobiles. Patching of these depressed strips has been ineffective. Some spots have been patched three times, but the same condition comes about again as heavy traffic pushes and compacts the strips. Where concrete has been used as a base for the strips, a much better job has resulted; hence, in future, concrete roads will generally be widened only with rigid-based strips.

A ten-mile stretch of US 90 between Live Oak and the Suwannee River in North Florida, a recent job, is typical of the work that the State Road Department is now having done. Concrete widening strips with a raised curb 2¼ in. above the level of the strips were poured monolithically by the contractor, the Jaxon Construction Co. of Jacksonville. This presented the contractor with something of a problem, as there are no standard forms for such curbing and it was necessary for the contractor to make his own forms. The old and new areas were resurfaced with a 2½-in. layer of asphaltic concrete.

● ***FINISHING a black-top surface on a Florida highway. Two Barber-Greene finishers complete a highway in a single passage.***

One of the problems the State Road Department and contractors have encountered in this work is getting the desired density. Standard width compacting equipment cannot be used for such widening. Some contractors have used a trench roller, but some of these do not have sufficient weight for quick compaction. The Jaxon Construction Co. on the Live Oak job used a 16-in. Buffalo-Springfield roller with better results than with other methods that had been previously used. This is a tractor with a rubber wheel on one side and a steel compaction wheel on the other side weighted to 300 lbs. per sq. in. compression.

On another ten-mile stretch of U. S. 90 east of Monticello an old concrete road has been widened with soil cement, a mixture of selected soil and 12% to 16% cement. This resulted in a hard foundation similar to low grade concrete. When the widening strips have been laid, the entire road is to be resurfaced with a 3-in. layer of sand asphalt to level it up and a one-inch layer of asphaltic concrete for wearing surface. Faulk & Coleman of Tallahassee are the contractors on this section.

Another widening operation of a different type is a 20-mile stretch of State Road 20 west of Tallahassee, an old sand-clay job that had become warped and distorted. It was widened with hot sand asphalt and covered with an asphaltic concrete wearing surface. Another 10-mile section of the same highway in the same condition is being widened with a natural sand-clay material and is to be surfaced with asphaltic concrete. The 20-mile stretch was done by Faulk & Coleman of Tallahassee with the Mac Asphalt Co. of Lakeland as the sub-contractor for the asphalt work. The 10-mile stretch was done by the Rich Construction Co. of Tallahassee.

Near Monticello a new wrinkle was tried recently by the State Road Department—new, that is, to Florida, although it is a method that has been frequently used by the armed services in rebuilding concrete runways. A very old concrete road, built before selected materials were used and before the establishment of present density requirements for the sub-grade, had deteriorated into a condition where segments would rock and pump when heavy trucks passed over them. Although the State Road Department has used some old concrete roads as a base for new surfacing, it was not considered practical in this instance because of the poor sub-grade that would be afforded. So the old concrete was broken up and rolled with a heavy roller to seat the pieces firmly into the subgrade prior to the placing of the new surface course.

All road widening operations in Florida require the widening of shoulders from six to ten feet, also the moving of adjacent ditches and the extensions of drainage pipe and box culverts. With the extensive mileage of two-lane highways, wide shoulders are necessary so that disabled cars can pull off the roadway and avoid traffic tie-ups. Because of heavy rainfall in some seasons, extensive drainage provisions are also necessary. Widening shoulders and moving and extending drainage facilities add heavily to road upkeep, hence the State Road Department has to look for economies in other directions.

One of the most widely practiced economies is to use the road materials that are most readily available. As soil conditions vary greatly throughout the state, the practice is to use local materials so far as possible. For example, where a good sand-clay formation is immediately available, this material can be obtained for 60 cents a cubic yard and it is used extensively. In the immediate vicinity of the limerock quarries in central Florida it is more economical to use that material than to haul others from a distance even though the cost greatly exceeds that of sand-clay in areas where sand clay is available. In concrete widening it is customary for most Florida contractors to use a four-bag mixer, with dry batch hauled from a batching plant, rather than use ready-mixed cement hauled by truck. Mixing on the road for dumping direct into forms has been found more economical. Soil-cement mixes are laid with special equipment in which the material is dumped into a hopper and carried on a belt to the trench as the machine moves forward slowly. In excavating trenches for widening, some contractors use a trenching machine and others a road patrol grader with a special blade attachment.

As Florida is a tourist state with long distances to be covered, the State Road Department frowns upon detours and generally requires that at least one traffic lane be kept open while work is in progress. In no case is a long detour permitted. This is one of the greatest difficulties encountered by road contractors in the performance of their work.

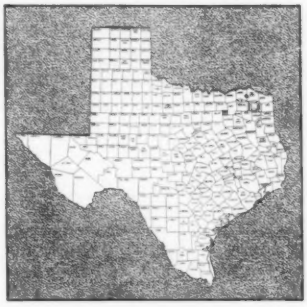
While Florida is mostly flat with an absence of steep grades, there is another condition that makes some of its road work difficult, and that is the muck that prevails in some localities. Sometimes it has been necessary to excavate bogs to a depth of 30 ft. and backfill with

(*Continued on page* 68)

● ***BASE course is completed with a Buffalo-Springfield trench roller as first step.***

WATER WORKS PRACTICES IN TEXAS

BASED on courses given at the recent Texas Short School, here are some of the practices recommended in that state. The abstracts below are from the 1952 school, and were furnished through the kindness of the State Department of Health of Texas.



Rating Water Systems for Fire Protection

A city is rated on the measure of its fire-fighting ability. Three main elements are considered: The water system; the fire department; and such other items as quality and enforcement of fire prevention ordinance and street conditions. A weight of 50% is given to the water system according to Jerome H. Schwab, engineer of the State Fire Insurance Commission. The following points are considered:

The pumping equipment must have a minimum capacity, even for the smallest city, of 500 gpm and must be in duplicate. For larger communities, the capacity must be based on 110 gpcd; equipment must be in duplicate; power must be adequate and reliable; elevated storage must be based on usage at 110 gpcd and the equivalent of a 10-hour supply stored at an elevation 100 ft. above the mercantile and industrial areas. Ground storage minimum is 50,000 gals. Minimum main size in the business and industrial sections is 8-inch, with 6-inch loops permitted not over 2 blocks long. Hydrants must be available at every intersection in the business district and at every other intersection or block in residential areas. Hydrants must have 5-inch valve openings, with one pumper and two hose connections. Pumping stations must be of fireproof construction with solid masonry walls and reinforced concrete roof.

In answer to questions, Mr. Schwab stated that the use of unapproved unprotected steel pipe resulted in a penalty in rates; that meters are permitted on fire service connections, but connections without meters are preferred; and that hydrants must be maintained in a fully operable condition, with flushing, greasing and oiling required every three months, and painting with a distinctive color once a year.

Unaccounted-For or Non-Metered Water

Unaccounted-for or non-metered water is determined by deducting the total metered water supplied to the consumers from the total water pumpage, according to J. L. Horner, City Manager of Carthage, Texas. Industrial plant emergency systems and fire lines, though used in emergencies only, should be checked occasionally to determine unmetered water usage and loss. If water losses are greater than 3,000 gpd per mile of pipe, or 10% of the total water pumpage, a water survey is in order.

J. R. Bryan, Director of Public Works of McKinney, stated that the average meter error was 2%, but was much greater in old meters, which may be as much as 10% in error, if not properly maintained. High meter losses in small water systems are usually due to improper meter repair. Municipalities with as many as 2,000 water connections could ordinarily pay for a trained meter repair man through revenues otherwise lost.

Detection of losses was considered by A. J. Fuchs, Water Superintendent, Karnes City. All municipal departments and the general public should be instructed in immediate reporting of surface leaks. Sewage plant operators should also report any sudden increase in flow to the plant. An aquaphone may be used very effectively in locating leaks.

Using Plastic Pipe

Polyethylene pipe was first used for handling corrosive mine wastes, according to C. R. Stowe of Carlon Products Corp. Scrap polyethylene was used for this, and it was found to impart taste and odor when used for potable water. Pure polyethylene, however, does not impart either taste or odor, or give off any toxic products. This pipe is identified by a white longitudinal stripe.

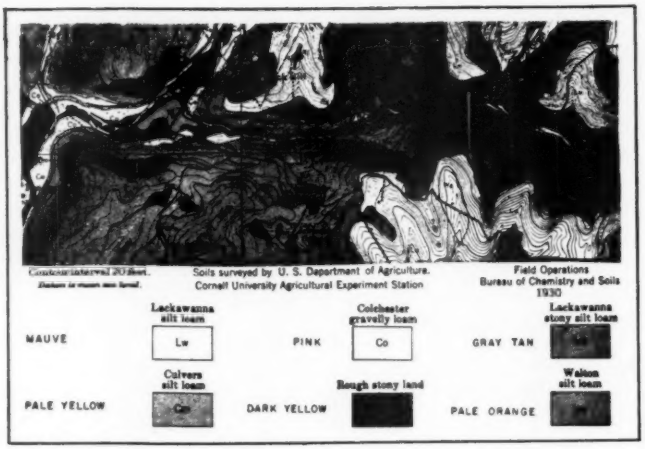
Such pipe must not be used where the water temperature exceeds 140°F; it will withstand freezing temperatures, but if frozen, strong heat should not be used for thawing. Connections can be made with insertion sleeves and stainless steel clamps. Threaded fittings are available for various types of connections —tees, ells and couplings. Strap wrenches are recommended on fittings—though pipe wrenches may be used with caution, said W. C. Pickens of Houston. Also, plastic pipe can be pulled under streets, just as is done with copper, if a pulling finger is used. In backfilling, fine dirt or sand should be placed around the pipe before the excavated material is replaced. As yet, Mr. Pickens stated, the pipe does not have the approval of the Board of Fire Underwriters, no formal application having been made. Experience has demonstrated that the pipe is not affected by very strong chlorine solutions.

Sanitary Protection of Surface Reservoirs

Lakes used for water supply should be surrounded, according to L. W. Smith, Water Superintendent, Cameron, Texas, with an all-weather road built on the 10-ft. contour above high water level. This road should be adequately patrolled in respect to bathers, fishermen and picnickers. Suitable signs should be placed to warn the public not to camp or picnic at or near the water's edge. A sanitary officer should be appointed, with full police power, to enforce such regulations. In a small community, this may be the water superintendent. The municipality should own the land for at least 1,000 ft. from the water line and should have full sanitary supervision and sanitary control of all drainage contributing to the supply.

(*Continued on page* 64)

● *SOIL map, Fig. 1, by USDA shows designations for the various types of soils.*



Soil Percolation Rates

JOSEPH C. FEDERICK,
Assistant District Engineer, New York State Department of Public Works

INCREASING residential construction in areas lacking sewers has focused attention on the necessity for a better means of household sewage disposal. Reliance often must be placed on septic tanks with subsurface tile fields, or on leaching cesspools. In such cases, the necessity for determining the proper absorptive capacities of the various types of soils is of both economic and public health importance

This can be done satisfactorily only by means of the percolation tests, which is an empirical method of determining the allowable sewage loading of such land treatment facilities. The test is performed by excavating a hole one foot square and about 18 ins. deep—the depth at which the tile field is generally placed. The hole is then saturated with water until the rate of seepage becomes constant. It is then refilled with water to a depth of 6 ins. and the time required for the water surface to drop one inch is noted. In the case of leaching cesspools, the depth of the test hole should be about one half the depth of the contemplated installation.

It must be recognized that the majority of subsurface tile fields are installed by builders who do not perform percolation tests. The amount of tile to be laid is decided arbitrarily, perhaps by a visual examination of the soil characteristics. The sanitary engineer has also been slow to utilize all of the information that is available for determining the suitability of soils for subsurface disposal, despite the availability of information provided by soil surveys and the accompanying soils maps of the Bureau of Chemistry and Soils of the U. S. Department of Agriculture.

The Soil Survey

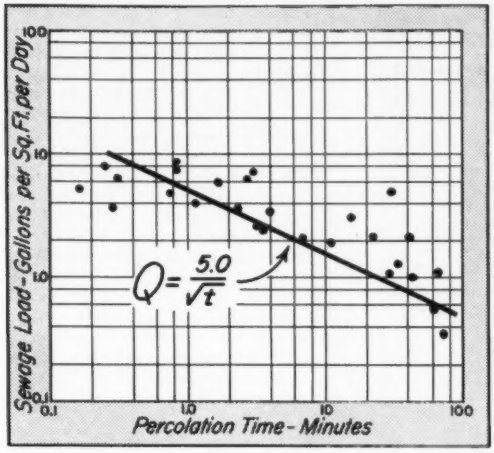
The soil survey is an inventory of the soil resources of an area, usually covering all or part of a county. The results of the survey are shown on a map, such as Fig. 1, which indicates the outline, extent and location of the different types of soils. Accompanying the survey is a detailed report which completely describes the types and characteristics of the soils. These are broadly classified as upland and valley soils, with a further grouping on the basis of drainage and reaction. Each type of upland soil is described and classified as poorly, imperfectly or well drained, or as permanently wet. Valley soils are classified similarly, with additional information as to source, as from ice-laid or cold water-laid deposits, or alluvial materials. In general, the method of classifying the soils and the terminology used has been confusing to the sanitary engineer.

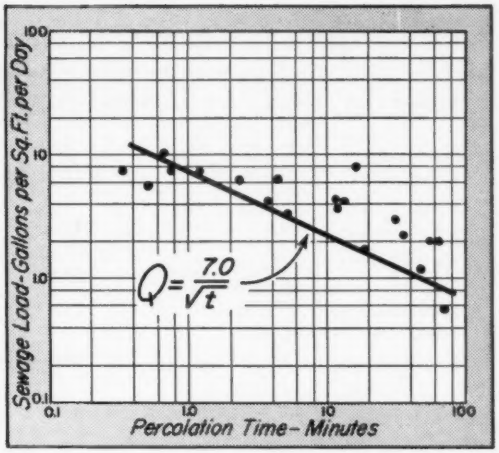
For instance, the term "loam" is used loosely by householders, builders and others. It is primarily an agricultural term. Loam is a mixture of the basic soil fractions—sand, silt and clay. A straight loam may be 50% sand and 50% silt. The limiting boundaries of a loam soil are 30% to 50% sand, 30% to 50% silt and 0% to 20% clay. With an increase in sand up to 80%, it is a sandy loam. With a maximum clay content of 30%, it is a clay loam. Thus, a soil designated as a loam may vary widely as to actual suitability for subsurface disposal.

A vertical plane passed through the soil would show a series of layers. The sectional elevation, taken as a whole unit is termed a "profile." The layers taken individually are termed "horizons." The characteristics of the profile, together with such features as drainage, relief, parent material and geographic distribution determine how soils are classified.

In mapping and classifying soils in the field, three units are used—series, type and phase. The primary unit is the series, which includes soils having the same color, structure, relief, drainage and parent material. The soils of a series are identical in all respects except the texture of the first horizon. The series is named for some geographical feature of the region where first identified.

The types within a series are designated according to the texture





and Soil Characteristics

of the top horizon, such as silt loams, gravelly loams, sandy loams, etc. The combination of series, name and type of textural designation gives the complete soil name, as "Dunkirk fine sandy loam."

When a soil type has characteristics which merit recognition, but are not sufficiently important to warrant a separate type designation, a subdivision termed a "phase" is used.

Soil maps can be used to advantage by the sanitary engineer in determining the adequacy of specific areas for subsurface sewage disposal. The writer knows of at least one place where difficulties are being experienced with household sewage disposal which could have been forecast by reference to the soil maps of this area. In this case, the provisions of sewers and sewage treatment in the first instance would have been an economy.

Soil Classifications

There are numerous ways of classifying soils, as by geologic origin, mineralogical content and type of structure, by Atterberg limits and by grain-size distribution. Classifications systems have been prepared for specific purposes, as the Casagrande classification for airfield projects and the Bureau of Public Roads classification for highway purposes. What the sanitary engineer needs is a method of classification that is simple, but has a definite connotation.

● ***CURVES above for tile disposal, left, Fig. 1; and cesspools, right, Fig. 2.***

The Bureau of Soil Mechanics of the New York State Department of Public Works has developed a system which can be used by sanitary engineers and public health agencies as it provides a uniform nomenclature for describing soils. In this:

All soils are classified on the basis of grain size into four groups —gravel, sand, silt or clay. Sands and gravels are coarse-grained cohesionless soils which are further subdivided as "fine" or "coarse" on the basis of grain-size ranges. Silt, which may be organic or inorganic in character, is that material which passes a 200-mesh (0.074 mm) screen and is retained on a 0.002 mm mesh screen. Clay is that material of such fineness as to pass the 0.002 mm mesh screen. These grain size ranges are shown in Table 1.

A special feature of this system is the method of describing a soil which is composed of various soil fractions. In this, the predominating type of soil is listed first, and capitalized, as COARSE SAND, or FINE GRAVEL, or SILT. This is followed by entries which indicate the second and/or third component material. The amount of this material is indicated by the use of "and" for a soil containing 40% to 50% of the secondary component; the use of "some" for 10% to 40%; and the use of "trace" for 10% or less. An illustrative description for a sample predominantly of fine gravel with 40% to 50% of coarse sand would be: FINE GRAVEL and coarse sand. Another description might read FINE SAND, some silt and trace of clay. This would describe a soil with 55% sand, 40% silt and 5% clay, which would be called loam by the layman.

A desirable method of determining the soil type for the sanitary engineer is by making a sieve analysis of a soil sample. This should always be required before approval of an installation is given. This analysis may be plotted on a chart with the sieve numbers arranged logarithmically. Such charts are available which have space for notations showing the location and project, as well as moisture content, consistency, color, etc.

The facility with which a liquid passes through the soil pores is of

TABLE 1—NEW YORK STATE DEPARTMENT OF PUBLIC WORKS GRAIN SIZE RANGES

Soil	From Sieve No.	From mm.	To Sieve No.	To mm.
coarse	4"	101.6	1"	25.4
fine	1"	25.4	#10	2.00
Sand-				
course	#10	2.00	#40	0.420
fine	#40	0.420	#200	0.074
Silt	#200	0.074	—	0.002
Clay	—	0.002	—	

TABLE 2—REPRESENTATIVE SOIL DATA

Soil Description	Sample 1 Compact Glacial Till	Sample 2 Stiff Silty Clay	Sample 3 Compact Sand Some Silt	Sample 4 Coarse Sand	Sample 5 Compact Cinders
Dry Density lb. per cu. ft.	135	106.5	107	109	66
Natural Moisture Content %	10	18.5	19		
Specific Gravity (Average)	2.65	2.71	2.72		
Percolation Time (Minutes for 1 inch drop)	60 (Slight)	60 (None)	8.5	16	35
Sieve Analysis	Per cent passing sieve number				
2"	"	"	"	"	100
1½"	"	"	"	"	92
¾"	"	"	"	"	82
⅜"	"	"	"	"	68
#4	"	"	100	100	53
#10	89	93	100	82	42
20	84	88	99	60	34
40	80	84	98	37	27
60	76	80	95	19	22
100	70	77	89	9	19
200	61	76	85	3	18

particular importance in subsurface disposal. The law of liquid flow through a soil is given by Darcy's equation:

$$Q = k\,i\,A$$

in which, Q is discharge volume; k is a coefficient of permeability of the soil; i is the hydraulic gradient; and A is the total cross-sectional area of the soil mass.

Among the properties which affect the flow through the soil are the viscosity of the fluid; the grain size, since the seepage velocity through a soil is proportional to the square of the grain size; the voids ratio; and the presence of entrapped air or gas and of foreign matter. Normally, septic tank effluent will contain entrapped gases and considerable suspended matter. Laboratory studies show that the coefficient of permeability is materially affected even by small quantities of entrapped gases. The pores of the soil are restricted by the gas bubbles with a consequent reduction in permeability.

Table 2 gives the dry density, natural moisture content, specific gravity, grain-size distribution and water percolation rates for various types of soils. All tests were conducted by J. E. Christopher, Soils Engineer, District 3, of the State Department of Public Works. The methods used in determining the factors, other than the percolation test results, follow the recommendations of the ASTM. The tests were made on samples from undisturbed soil. Table 3 is from the unpublished notes of the late Henry Ryon and shows the approximate percolation rates for various soil types as determined by him. The wide variation between the reported results for percolation through cinders may be partly explained by the fact that the results in Table 2 are for "compacted cinders." Otherwise, the results are in fair accordance. However, the necessity for uniformity in describing soils is emphasized by the uncertainty regarding the precise soil types listed by Ryon. There is need for the adoption and general use of a nomenclature that will have a specific meaning.

On the basis of these data, the plots for subsurface irrigation systems and cesspools shown in Figs. 2 and 3 were prepared and the curves fitted. The following formulas representing these curves may be used in determining basic design loadings for sewage treatment of the types indicated:

For tile fields:

$$Q = 5.0 \div \sqrt{t} \qquad (1)$$

For leaching cesspools:

$$Q = 7.0 \div \sqrt{t} \qquad (2)$$

In these formulas, Q is the permissible loading in gallons per day per square foot of absorptive area; and t is the percolation test rate in minutes.

When tile is placed in trenches one foot wide, Q is also the loading in gallons per day per lineal foot of tile. For household sewage disposal, the number of feet of tile or the effective leaching area required per person can be obtained by dividing the per capita sewage flow by the basic value of Q as determined by formulas (1) or (2), as applicable. Percolation rates should be determined in the field. One minute should be the lowest percolation rate used, whether t is assumed or determined by test. When tentative designs must be prepared in advance of the percolation test, the values in Tables 2 and 3 may be used. Soils with percolation rates in excess of one hour are not adaptable to subsurface sewage disposal.

Table 3—Approximate percolation rates for various soil types*

Soil Description	Percolation Rate Time (t) for Water to drop 1 inch
Clean Coarse Sand	13 seconds to 1 minute
Cinders	30 seconds to 1 minute
Gravel and Clay with voids not filled	13 seconds to 45 seconds
Open Shale	2 minutes to 4 minutes
Fine sand or loam	2 minutes to 5 minutes
Sand and Clay or loam	5 minutes to 10 minutes
Clay with some sand	30 minutes to 60 minutes
Heavy clay or disintegrated rock	2 hours to 5 hours

*Ryon, Henry—Notes on Sanitary Engineering (unpublished) 1924. Former Senior Sanitary Engineer, New York State Department of Public Works.

The values obtained by Formulas (1) and (2) do not vary significantly from the values used by the New York State Department of Health nor from those of Ryon's, as presented previously by the author (1). The derived formulas do not represent the curves of best fit which could be obtained by the

(Continued on page 89)

● ***PERMANENT bait station in place, below, right; results of poisoning at one station shown above.***

Baited Buffer Strip for RAT CONTROL

SUCCESSFUL rodent control for a community of 400 people employed a relatively new method of procedure. Halsey, Ore., is a typical small town. Many of the residents have cows, chickens, sheep and other animals on their properties. Garbage and refuse collection and disposal can be termed slipshod. Yet, under these conditions, a successful rodent control program has been carried on at a small per capita cost.

The rodent control program was designed, first, to eliminate a heavy rat infestation; and, second, as an experiment to determine whether or not a community of this type could be freed and kept free from rats exclusively by the use of rat poisons. The labor for the program was furnished by the Oregon State Board of Health and the Linn County Health Department but the estimated cost of this labor is included in the cost data below. The program employed one unusual feature—the use of a buffer strip to prevent reinfestation.

The program was carried out in the following manner: All of the buildings in the community were inspected to determine whether or not rats were present; and each building found infested was treated with baits containing warfarin as the active poison. After the initial poisoning, these buildings were inspected from time to time—actually at intervals of about 6 weeks—until it was determined that they were free of rats. Permanent bait stations were placed in all buildings in the outer areas surrounding the city and these bait stations were checked from time to time to determine if they were effective in preventing reinfestation.

During the preliminary inspections, 147 of 181 buildings checked were found to be infested with rats. The program was initiated on April 23. During the months of June, July, August and September, 109 inspections were made and only five premises were found to be infested with rats. Four of these were near a grain warehouse. After treatment, no rats were found. In other words, the program was entirely successful.

Cost Data

In the initial inspection and bait placement program, 80 man-hours of work were required; and 404 pounds of bait were placed, which cost 23 cents per pound. Based on an estimated man-hour cost of $1.75, the total cost of the initial program was $232.92; and of the follow-up program $40.70, of which $9.20 was for bait. Total cost for bait was $102.12 and for labor, an estimated $171.50. The cost for the entire program, from April through September, for bait and labor, was 68.4 cents per person, of which only 25.5 cents was for bait and poison.

If a continuous program were carried on, the annual cost would be less than for a short program of the type described, since the considerable initial expense would be greatly reduced. It was estimated after the completion of the program that the cost per capita per year for bait only would be 7 cents and for both bait and labor would total only 30 cents.

The use of a buffer strip of buildings permanently baited with warfarin baits appeared to be effective in preventing or greatly reducing reinfestation. This is a relatively new idea. Initial careful examination of all premises to determine infestation, while necessary in a test program such as this would not normally be required in a long-range program.

JOINTING MATERIALS

RAYMOND B. SEYMOUR and DONALD F. DEAKIN

The Atlas Mineral Products Co.

THE most common water main pipe point is a bell and spigot type which was developed by Thomas Simpson in 1850. This type of joint is usually constructed by butting the spigot end against the base of the bell and yarning with material such as rubber, jute, hemp, cotton, oakum or paper for a depth of 1 to 2 ins. Yarning materials are used in order to dam-off the end of the pipe and thus prevent the jointing material from running into the pipe itself. Strips of yarning material are usually cut slightly longer than the circumference of the pipe to insure a tight joint when the material is driven home with the yarning iron.

Up until about 50 years ago, lead was practically the only jointing material used for bell and spigot joints. Even today in spite of the trend towards more economical compounds, lead is still widely used as a hot-poured jointing material. Regardless of the type of hot-poured product used, the joint is yarned, preferably with a rubber ring as described above. Then an asbestos runner is placed around the outside of the spigot piece and against the bell and a cone or funnel is placed in the "V" thus formed. The lead is then poured.

Lead contracts considerably during cooling and is not self-sealing. Therefore it must be caulked completely around the entire joint after pouring. Most engineers insist on the use of virgin lead which is furnished as pigs weighing 60 and 100 lbs. and as 3 and 6-lb. ingots. Before pouring, lead is melted until a spectrum ("rainbow colors") appears. Then it is skimmed and the joint formed with one pouring. Lead has a specific gravity of 11.3 (708 lbs. cu. ft.) and a melting point of 327° C. (620° F.). Lead joints are apt to loosen if the line is subjected to vibration, is frozen, or if the water in the pipe is heated above 140° F. Lead is not recommended for transporting highly alkaline water or for joints in soils having a high pH.

In spite of the annual use of approximately ten million pounds of proprietary sulfur compounds for joining bell and spigot cast iron pipe, too little factual information on these joints was available until very recently. In times of material shortages, the importance of a material that is saving some fifty million pounds of lead annually, should not be underestimated. However, no material should be used in distribution lines representing an investment of over three billion dollars unless it can be used with confidence regardless of the savings of critical materials or the economies involved.

As a result of considerable research extending over a three-year period and carried out jointly by industrial and university research engineers[1], it has been concluded that properly formulated sulfur type joints can be used with confidence, provided soluble salts are not present in the formulation[2]. Even before these series of research papers were published, there were considerable service data available to indicate that previously reported failures of pipe joints were statistically insignificant in terms of the large number of distribution lines in this country and Canada.

● ***PORTION of a 5-mile pipe line, using 6-inch and 8-inch pipe, which was jointed with sulfur compound. Ready for backfilling.***

FOR CAST IRON PIPE

A terra cotta pipe line joined with a sulfur-sand mixture and used to carry water from a spring to a residence was unearthed some years ago at Wilmington, N. C. It was thought to be at least 200 years old. Both the pipe and sulfur compound were in excellent condition after this long period of service. However, the first reported use in cast iron pipe joints was less than a century ago[3]. One of the best reviews of early formulations of sulfur compounds has been published by Kootz[4].

Some of the early proprietary sulfur compounds: Ferrein[3], and Spence Metal[5] were apparently admixtures of sulfur, pyrites, copper sulfide, silica and carbon. Solus, which was introduced about 50 years ago, was made up of sulfur and clay whereas Lavinit consisted of ground slag and sulfur Solus, Lavinit, and Hermanite were successfully used in German water mains. Thiolit, Sulit and Nutralead[6] were manufactured in France and England. There are at least four sulfur compounds manufactured in the United States today. Three of these have been available for over 20 years.

Sulfur compound joints are prepared in much the same manner as lead[7]. The asbestos runner must be mudded with puddled clay to prevent the sulfur compound from adhering and a tall pouring gate must be used. The sulfur compound should be melted, with stirring, in a pot equipped with a lid, at 265° to 290° F. and poured. This temperature range is readily recognized by the presence of a mirrored surface. The sulfur compounds are not sufficiently molten at lower temperatures and tend to thicken at temperatures above 300° F. While sulfur will not ignite even at temperatures above 500° F. in the absence of an open flame, it will ignite when over-heated over an open flame. Therefore, local over-heating should not be permitted. Sulfur fires can be readily extinguished by closing the lid or excluding air by covering the top of the pot with a damp burlap bag.

Sulfur compound joints are less expensive than lead, require no caulking and are more resistant to vibration. However, such joints leak or weep when first poured though they become tight in a comparatively short time. If the sulfur compound joints are properly poured, the trench may be back-filled immediately. As previously stated, lead has a density of 708 lbs./cu. ft. as compared to sulfur compounds with a density of 135 lbs./cu. ft. Using the price of lead at 15¢/lb. and 8.5¢/lb. for sulfur compound, the material cost for a joint in a 10-in. pipe would be $2.40 and 47 cents, respectively. The labor cost of installation of sulfur compounds is less than lead joints.

● ***POURING a water pipe joint with a hot sulfur compound.***

In comparative tests, weights were added to an 8-in. water main line under a pressure of 300 psi. This was supported between 20-ft. centers and weight was gradually added until failure. Under this test, a lead joint failed when the load reached 2,000 lbs., whereas a plasticized sulfur joint held water until the weight was increased above 5,700 lbs.

The initial leakage of a sulfur joint varies in accordance with the composition of the jointing material. For example, with a 12-in. pipe under 100 pounds water pressure, the initial leakage with Thiokol plasticized sulfur joints was approximately 11 gal./mile/hr. but this decreased so that practically no leakage was evident after the third day. The shrinkage of sulfur cement from the liquid to the solid state when poured at the correct pouring temperature is about 4%. Since this shrinkage takes place entirely in the pouring cone, there is no shrinkage in the joint itself.

● ***JOINT has been poured and the funnel is ready for removal.***

Other Joints

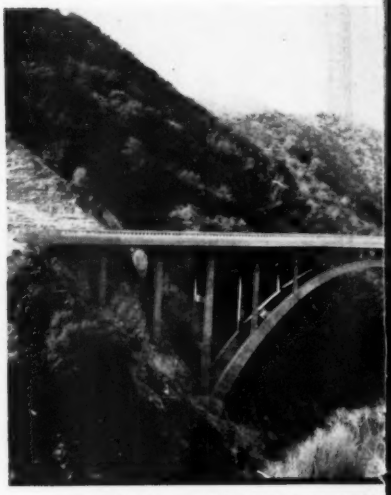
Shredded lead rope or lead wool, which is sometimes used, is caulked in one strand at a time. Unlike hot-poured lead joints, lead wool joints can be constructed under water. In a few isolated instances, mixtures of lead and red lead in oil have been used as a jointing material. Lead wool joints are somewhat more expensive than lead joints but in general have the same advantages and disadvantages. For a 2-in. deep joint, approximately 1.8 lbs. of lead wool is required for each inch size of pipe.

Special pipe restricted in size to small diameters is furnished with a precast lead joint in the bell. This type of pipe is caulked after the spigot is shoved home.

Portland cement joints have been

(*Continued on page* 91)

● *BANKS along highway have been planted with native shrubs.*



● *SPAN over West Fork is 116'*

MODERN DESIGN FOR

MARK McMILLIN

COSTING a total of $3,900,400, a modern freeway now is open to 2,300,000 motorists who annually make summer visits to the beautiful San Bernardino Mountains in Southern California. The 15-mile highway was completed by stage construction of five units, over a period of more than sixteen years. The original road dates back to 1884, when extensive logging operations penetrated deeper and deeper into the heavily wooded mountains.

The first logging road, on which the public had to pay toll, was built up the sheer rocky slopes of City Creek. About 1891, this original road was graded and used extensively, as the citrus industry developed and more and more packing boxes were required for shipping the oranges. Soon, however, the Federal Government acquired the San Bernardino National Forest, and logging operations practically ceased. As a result, the old logging road was taken over by San Bernardino County.

County engineers at once reduced some of the most dangerous hairpin curves, cut the 18% to 20% grades to 10% to 12%, regraded the roadbed to about a 22-foot width, and applied oil surfacing 16 ft. wide. But the road—the main access route into the increasingly popular mountain resort districts—was, in 1937, taken into the State's secondary highway system. State engineers further improved the road as it became obvious that the only other route into the mountains, by way of Waterman Canyon, was in danger of being seriously overloaded. In the meantime, the permanent population of mountain camps and villages had increased to 25,000, and during 1947 alone, some 1,765,900 visitors had entered the resort area.

High standards for this mountain road

The State Highway Department decided to reconstruct the City Creek route into an ultra-modern high-speed limited-access freeway, to be built in five units. On August 1, 1948, the first unit of 3.2 miles leading from East Highland Avenue in San Bernardino to the old City Creek was completed. The following year, the second unit of 4.3 miles was completed. The third unit of 1.8 miles was finished in February, 1949, and the fourth unit of 4.0 miles was completed in November, 1950. The last unit, of 1.7 miles, was finished in September, 1951, with a three-day celebration in the mountain resort of Running Springs.

The two greatest problems of the construction of the new freeway were the clearing of the right-of-way and the excavation. For the former work, many makes and types of euipment were used, including a new HD14 Allis-Chalmers tractor, which was used chiefly in clearing operations, and other A-C tractors. Other equipment included Caterpillar tractors, scrapers and motor graders; a Link-Belt, a Bucyrus-Erie and a Lima shovel; tamping rollers, Koehring Dumptors, Le Tourneau Carryall scrapers, Terra Cobra scrapers, water trucks, and pumps.

Because of the heavy rocky terrain, only the most sturdy equipment was practicable. The excavation of 328,000 cubic yards of earth and rock necessitated gouging out sides of steep mountains, the construction of numerous retaining walls of concrete and metal cribbing, and the incorporation of brush mats to prevent erosion. Native quick-growing shrubs and trees were seeded and planted along the high embankments further to prevent erosion. These methods of erosion prevention, originated by the State engi-

above stream and has 160' arch.

● *METAL bin-type retaining walls protect steep slopes from erosion.*

CALIFORNIA FREEWAY

neers, saved thousands of dollars in construction costs. Erosion is always a grave danger in this district of heavy rainfall and snowfall.

Metal cribbing was extensively used, especially in the steeper sections of the road where the mountains rise precipitously on one side and drop off sharply into deep canyons on the other. In sections less steep, concrete cribbing was used.

The entire new freeway closely follows the line of the old county road, but was built at different elevations in order to eliminate the existing steep grades and sharp curves. The plans provided a maximum 7% grade, and a 300-foot minimum radius curvature. This is an unusually high standard for rugged mountain road curves. The visibility distance permits safe driving and is expected to minimize accidents. A special safety feature in the alinement design is the interspersing of tangents long enough to give a safe passing distance for the faster-moving vehicles around the slower ones. The highway is 26 feet wide, with two eleven-foot traffic lanes of three-inch, plant-mixed bituminous surfacing, and two-foot paved shoulders on either side. All gutters and shoulder dikes are surfaced with plant-mix on a 6-inch selected material base.

Since the new road is classified as a limited freeway, controlled points of access were worked out in advance with abutting property owners, who cooperated in every detail. Also, since the entire route lies within the San Bernardino National Forest, close cooperation was necessary between the Forest Service and the State Highway Department. It was agreed that the usual forest regulations and requirements in regard to fire prevention and suppression would be observed; that the Forest Service would maintain access to present and future forest roads; and that the Highway Department would protect against erosion, would leave streams undisturbed, and would build the highway with minimum interference with scenic beauty.

It was also agreed that no signs, except those necessary for directions and information, would be permitted on the State's right-of-way. In return, the Forest Service agreed to issue no new special use permits within a strip of 200 feet from the centerline of the highway without first consulting the State Highway Department and securing its advice and recommendations. Because of these various agreements, the new road is expected to be forever free of undesirable road signs and "hamburger shacks" which detract from the natural beauty of the magnificent mountain scenery.

eliminate steep grades and sharp curves

Since the new freeway is built in extremely rocky and mountainous terrain, a great many unusual problems were encountered. In constructing the second unit, a distance of 4.3 miles, for example, it was necessary to move 655,000 yards of roadway excavation, and to install a field-assembled culvert 132 inches in diameter for the Plunge Creek waterway. The third unit necessitated the moving of 580,000 cubic yards of dirt and rocks, and building a seven-foot reinforced concrete arched culvert more than 1,000 feet long to carry the waters of Lonesome Creek under the fill carrying highway.

However, the greatest single problem encountered was the bridging of the West Fork of City Creek, a roaring mountain torrent rushing through a deep canyon. This new bridge, reputed to be one of the

(*Continued on page* 90)

A STUDY OF SLUDGE DEWATERING AT A SMALL PLANT

HARRY EICHENAUER,
Supt. of Sewage Treatment,
Liberty, N. Y.
and
GEORGE E. SYMONS,
Consultant & Technical Editor,
Larchmont, N. Y.

SLUDGE is dewatered at this small, complete sewage treatment plant by a coil spring type vacuum filter which is almost entirely automatic in action. One man, with some seasonal help, operates the plant. This article describes the results of a study of the operational results of the sludge filter.

The biofilter sewage treatment plant at Liberty, N. Y. was the first constructed in the east and still is one of the largest municipal (non-military) installations in the country. Designed by W. A. Hardenbergh, the plant went into operation in August 1940.

This plant is unique in that it operates as a standard rate trickling filter in the winter months when the population tributary is 7500, and as a two-stage biofilter in the summer months when the population tributary is 15,000 and the population equivalent load is 20,000. This high summer load is due to the influx of summer residents (the area is a vacation spot for New Yorkers) and to the operation of laundries, milk receiving stations and a slaughter house.

The plant is unique, too, in that it installed the first Komline-Sanderson coiled spring vacuum filter. The present article is devoted to some observations on the operation of that unit.

A complete description of the plant and detailed operating data on the biofilter have appeared in previous issues of *Public Works* (July, 1940, Oct., 1940, Dec., 1941, and Dec., 1947). A brief review of the plant's features is desirable, however, as an introduction to this article.

The plant consists of a Link-Belt Tritor screen; rectangular settling tank (built in 1931, and equipped with Link-Belt collectors); two 80-ft. dia. biofilters, three ft. deep, with Dorr distributors; a secondary settling tank with a Dorr clarifier; a magnetite filter and two Dorr digesters. Covered sludge beds were installed in 1931, but these were relegated to standby service when vacuum filter dewatering of sludge was installed in 1939. A gas boiler serves to heat the first digestion stage. The final effluent is chlorinated before it passes through a magnetite filter.

● ***OPERATING building in foreground; sludge dewatering house in rear; old covered sludge drying beds partly hidden from view.***

This plant was designed for a flow of 1.0 to 1.2 mgd, with a BOD loading of 425 ppm. It utilizes a recirculation ratio of 2 to 1 at 1 mgd raw sewage flow. This gives a detention period of 70 minutes in the primary tank and 60 minutes in the secondary tank. Rate of application to the filters is approximately 13.0 mgad.

Operation Data

Summer flow averages 1.2 mgd, while winter flow averages 0.75 to 0.8 mgd. The sewer system is not of the combined type, but there is so much infiltration that following a two or three day rain, the flow will reach 2.0 to 2.5 mgd. No bypass is provided for handling high flows.

Recirculation is practiced only in the summer months with a recirculation ratio of about 2 to 1; that is, irrespective of the raw sewage flow, 1400 gpm of primary filter effluent are returned to the influent of the primary sedimentation tanks, and 1400 gpm plus the raw sewage flow are applied to the primary filter. At the same time, 2100 gpm are applied to the secondary filter (raw sewage flow equivalent from the primary filter and makeup from the secondary settling tanks). The effluent from the final settling tank is chlorinated and passed through the magnetite filter. Chlorine is added only in the summer time and at a rate of 25 lbs. per day to produce a residual of 0.4 to 0.6 ppm. The final effluent from the plant is discharged to a small stream which has a flow in summer about equal to the flow from the sewage plant.

The data in Table 1 are typical of operation results for two different seasons.

Imhoff cone data indicate that in summer operation, the raw sewage contains 11 to 12 ml of solids per liter, while the primary tank effluent contains only 0.7 ml per liter and the final effluent less than 0.1 ml per liter. In the winter, the raw sewage contains 7.0 ml of solids per liter.

During summer operation, approximately 900 cu. ft. of sludge are transferred each day from the primary tank to the first stage sludge digester and in one month 450 cu. ft. of secondary clarifier sludge were transferred to the primary sedimentation tank.

Approximately 11,000 cu. ft. of gas are produced each day in the summer months and 7000 cu. ft. per day in winter.

Sludge Disposal

The data on suspended solids indicate a loading on the digesters of an estimated 1700 lbs. of solids per day in the summer and 1000 lbs. or less per day in the winter. Capacity of the digesters is sufficient to allow for complete digestion and it is probably safe to estimate that the volatile content of the raw sludge is reduced from approximately 68 per cent down to 45 per cent or so.

Sludge is not withdrawn from the digesters during the midwinter months and is drawn only as necessary from April through November. The frequency of sludge withdrawal is indicated by the schedule for the month of August, 1950. Drawings were made on the 2nd, 8th, 9th, 15th and 26th of the month, totaling 114 cu. yds. This schedule of intermittent sludge withdrawal is possible by the use of vacuum filter dewatering.

The equipment for sludge dewatering and disposal consists of a sludge well below floor level, bucket elevator to lift the sludge to an overhead mixing and flocculation tank, lime slurry tank, ferric chloride tank and pump, vacuum filter and endless belt conveyor.

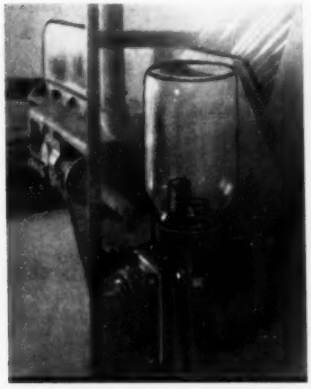
The vacuum filter is a Komline-Sanderson coiled spring unit, 8 ft. in diameter and 6 ft. long. This type of filter is constructed with stainless steel decking, over which two layers of coiled springs (like cords) are laid down in overlapping positions by means of rotating grooved cylinders. Vacuum is produced under these coiled spring "cords" by means of a combined vacuum and filtrate pump.

The drum rotates in a tub and the vacuum is applied for fifty per cent of the time of rotation, from bottom to top dead center. The coiled springs in two layers serve two purposes, that of filter medium, and that of cake discharge mechanism. Both layers of coils pass over a discharge roll at some distance from the drum. Stainless steel fingers strip the cake from the coils allowing it to fall onto a conveyor belt.

After passing over the discharge roll where all of the coils are flexed in one direction, the layers are separated and pass over separate grooved alining rolls, where the coils are flexed in the other direction. A spray wash following these alining rolls cleans adhering cake particles from the springs, but it is the flexing action which keeps the helix of the spring clean. The alining rolls also cause the coiled springs to be laid down on the drum in the same overlapping position as in the previous passage so that the filtering surface always consists of the two layers of springs, one overlapping the other in staggered position.

Differing from other vacuum filters, the vacuum pipes are outside the drum. Total power installed for operation is 23 hp on this particular unit of 150 sq. ft. of drum surface.

Appurtenances for this installation include Link-Belt lime mixing tank and elevator feeder, Link-Belt bucket elevator for feeding sludge, Proportioneers Ferr-O-Feeder for



● ***SIGHT-flow glass has been installed on Ferr-O-Feeder.***

● ***FERRIC chloride tank in the foreground; feeder at rear.***

TABLE 1—TYPICAL OPERATING RESULTS

	Winter				*Summer*			
	B.O.D.		*Susp. Solids*		*B.O.D.*		*Susp. Solids*	
	PPM.	Total % Rem.*	ppm.	Tot. % Rem.*	ppm.	Tot. % Rem.*	ppm.	Tot. % Rem.*
Raw Sewage	260	—	246	—	360	—	272	—
Prim. Set. Infl.	260	—	246	—	330	8.3	196	28.0
Prim. Set. Effl.	210	10.3	96	62.0	207	42.5	100	64.3
Prim. Filt. Effl.	150	42.3	72	71.0	133	63.0	96	64.8
Sec. Filt. Infl.	140	46.2	78	68.4	100	72.0	108	60.2
Sec. Filt. Effl.	103	60.5	50	79.8	56	87.0	68	74.5
Sec. Set. Effl.	50	81.0	39	84.0	31	91.2	24	91.5
Final Effl.	50	81.0	39	84.0	12	96.6	14	94.8

*i.e., Cumulative % Removal

feeding ferric chloride solution, a coagulating or mixing tank, Nash-Hytor combination vacuum and filtrate pump, and belt conveyor to remove sludge cake to truck.

Hydrated lime is dumped from bags into a slurry tank where it is mixed. Anhydrous ferric chloride is obtained in small metal drums. The method of dissolving the ferric chloride is of interest. Unlike many installations, the solution tank, below the floor level, is concrete, without any protective coating of any kind; no paint, no asphalt, or other material. The metal drum containing the anhydrous ferric chloride is rolled over the solution tank and holes are punched in both bottom and top. A hose is placed in the top hole and water allowed to trickle through the drum, out the bottom hole directly into the solution tank. This simple system and solution tank avoids costly equipment for handling, dissolving and storing the solution. It also simplifies the problem of handling the ferric chloride containers.

Operating Problems

At this particular plant the principal object is to "get rid of" the sludge. Therefore it is not essential that the moisture content of the sludge cake be reduced to less than 80 per cent (20 per cent dry solids). At this moisture concentration the sludge can be removed readily by belt conveyor to dump truck and carted away.

In experimental tests made with a portable Komline-Sanderson filter, it was found that best results were obtained when the ferric chloride solution was added ahead of the lime; this is the reverse of usual procedures, but gave the best results at Liberty. The ferric chloride is added as the sludge enters the mixing tank and the lime is added at about the half-point of the mixing tank.

Vacuum is applied to the under side of the coiled springs for 180 deg. of rotation from dead center bottom to dead center top. This means that the pickup area is held to about 30 degrees of rotation. Vacuum is maintained apparently only from bottom zero degrees to 120 degrees of rotation. At this point the cake cracks and large amounts of air pass through the cake during the next 60 degrees of rotation after which the vacuum is cut off from the drum.

Little difficulty has been encountered in picking up a cake on the drum when chemical dosage was properly maintained. During the first year of operation some difficulty was experienced in maintaining a constant ferric chloride feed, but this was shortly rectified by the manufacturer.

Test Data

The coiled spring filter is 8-ft. diameter and 6-ft. length, with an area of 150 sq. ft., of which 75 is under vacuum. With an average revolution requiring 3 mins. 5 seconds, the area under vacuum is 24.3 sq. ft. The vacuum is held at 4 to 6 ins. of mercury. Power installation is as follows: Drum drive, 1.5 hp; agitator, 1.5 hp; vacuum and filtrate pump, 20 hp, giving a total of 23 hp or 0.153 hp per sq. ft. of filter area.

During the test, the digested sludge contained 8.51% dry solids and the feed rate was 30 gpm or 21.5 pounds of dry solids per minute. Ferric chloride dosage was 13% or 5.77 pounds per 100 pounds of dry solids; lime dosage was 12% or 10.25 pounds per 100 pounds of dry solids. Dry solids in the sludge cake were 20%, giving a discharge rate of 25 pounds per minute, 10 pounds per sq. ft. of filter per hour or 0.5 lb. per sq. ft. of filter surface exposed per hour. Volume of filtrate liquor was 23 gpm, with suspended solids of 200 ppm, equivalent to 0.037 pounds per minute. Wash water volume was 4 gpm and this contained 0.78% suspended solids, equivalent to 0.25 lb./min.

The tests reported here consisted of the treatment and collection of three loads of sludge cake during a period of three hours. Each test period approximated 40 minutes. It was impossible to obtain the weight of the truck loads of sludge, but by carefully weighing a five-gallon pail of the sludge cake it was possible to estimate the weight of the total sludge produced.

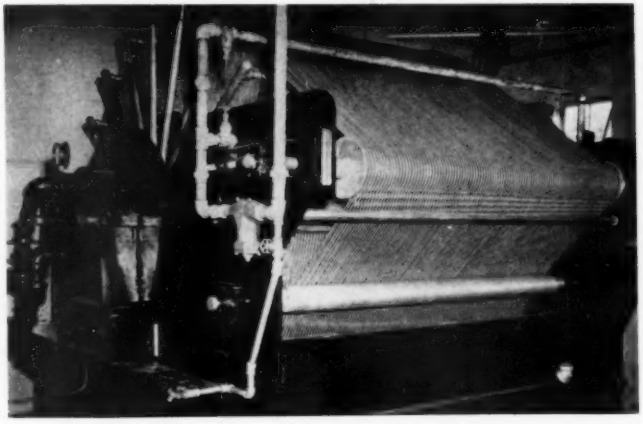
Samples of sludge, lime, ferric chloride solution, sludge cake, filtrate and used wash water were taken during the tests. From the analyses of these samples and the estimated weight of the sludge cake, operation productivity of the filter was determined.

The speed of rotation of the filter drum was determined during the tests and the rate of feed of sludge, ferric chloride, lime, and rate of discharge of wash water were determined by timing the discharge. The rate of filtrate discharge could not be measured but was calculated from the analysis of the digested sludge and sludge cake.

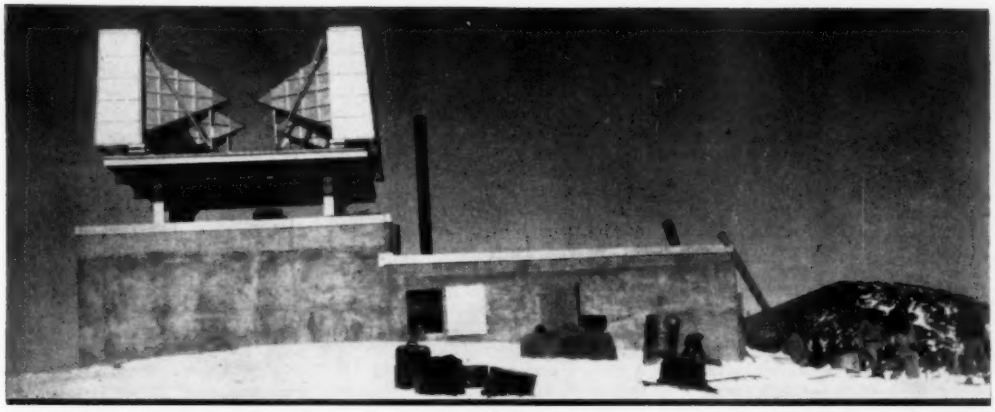
The calculation of sludge cake discharge appears to be reasonably correct. Calculations based on the digested sludge treated and the chemical dosage indicate 24.9 lb. of dry solids per min.; sludge cake data plus filtrate liquor and wash water data indicate a production of 25.35 lb. of dry solids per min. This agreement shows that in spite of some rather crude methods of measuring, the data are reliable indications of the actual performance of the filter.

The amounts of chemicals added seemed to be higher than is commonly found in other plants treating digested sludge, and it is possible

(*Continued on page 70*)



● ***FILTER at the Liberty plant before conveyor was installed.***



• ***RADIO relay station at Mt. Rose. Standby equipment is housed in concrete building at right.***

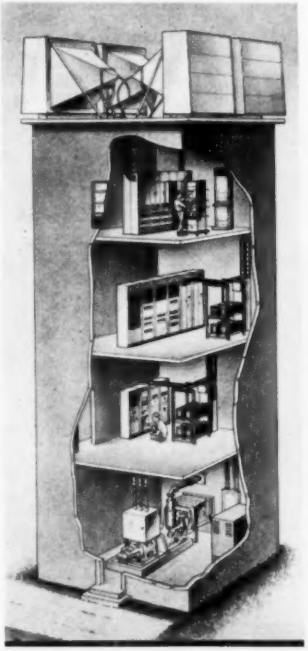
"STAND-BY" POWER MEETS AN EMERGENCY

Electric power in large amounts is needed to operate the nation's telephone system. Normally this power is supplied by commercial AC sources, and is converted within the various telephone centers to DC of proper voltage. The DC power is then used to maintain full charge on storage battery installations which are the immediate source of power for the many types of equipment, ranging from tiny switchboard lamps to automatic dial switching systems.

Power is required for many kinds of telephone centers and facilities: local switchboards and dial systems; long distance centers; the toll line network which interconnects local and toll switching centers; and the rapidly spreading network of coaxial cable and microwave radio-relay systems which now pipe radio and TV network programs as well as telephone communication.

Most telephone installations are provided with standby emergency power supplies, either permanently installed, or available on short notice through portable facilities.

In all, the Bell Telephone System has between 50,000 and 60,000 KW of emergency generating equipment on hand in the event of a failure of commercial power, as has happened due to hurricane, blizzard, severe ice storms, tornadoes and other natural forces. Today there is also the possibility that commercial power may be interrupted by enemy attack. In such a situation it would be more important than ever that telephone communication be maintained to summon and direct police, fire fighting forces, medical units, civilian defense and military forces.



• ***TYPICAL relay station design.***

487-Hour Standby

A recent example of utilization of standby power took place on the Pacific Coast last winter. During the blizzards of January 1952, most severe in half a century, a minor item crept into the news along with headlines of snow slides, mud slides, isolated towns, snow-bound automobiles and trains. Snow slides took out 1600 feet of a 50-mile electric power line supplying a microwave radio-relay station of the Bell System's cross-country line at Mt. Rose, 10,000 feet up in the Sierra Mountains of Nevada. For an estimated 487 hours, however, this station, one in a line of 107, kept on uninterruptedly flashing TV network programs on the coast-to-coast hook-up. Soon after the commercial line went down, a standby generator in the base of the microwave tower was cut into operation by automatic starting devices. For 20-plus days and nights it kept the batteries at full charge until crews fought their way through with "Sno-Cats" to restore the power line. The Detroit diesel engine carried the load without attention, since the station is not continuously attended by personnel under normal conditions.

A second instance was on a

broader scale and of more public significance than uninterrupted maintenance of a TV network. In the great wind storm that lashed the East Coast states in November 1950, commercial power lines supplying 450 telephone exchanges went down under fallen trees, branches and other debris. Were it not for standby power, the 1,800,000 telephones served by these exchanges would have been "dead." Actually not a single exchange was silenced for lack of power, as auxiliary units picked up the load and carried on until normal power supplies could be restored.

Virtually every type and make of standby system has been tested and many used in the telephone network—Diesel, gasoline, city gas and kerosene. They range in capacity from well under 5 KW for the smaller portable jobs, weighting 300 pounds or less and easily loaded onto a pick-up truck, to 1000 KW affairs. There are more than 4,000 standby generating units in the Bell System, over 2,000 of which are permanent installations.

The automatic starting feature mentioned in connection with the Mt. Rose microwave radio relay tower is not in general use. Most central office emergency generators require manual switch operation for starting, since battery reserves are in most cases more than sufficient to keep exchanges going until maintenance people, if not already on the job, can reach the locations. The power plants at the relay stations, however, have elaborate control systems. They will cut in, after a predetermined delay period, in the event of a prolonged voltage drop, a power failure, or on signs of irregular operation. After cutting out, they are regulated to avoid cutting in a second time too soon, "waiting" to see if normal conditions return. Automatic signalling systems report to distant maintenance centers not only the condition of the power supplies, but also indicate the source and type of any trouble conditions that may occur in a microwave installation. This is accomplished by means of a grid of lighted signal lamps on which a stencil can be superimposed by test men to spell out the precise nature of the irregularity.

• • •

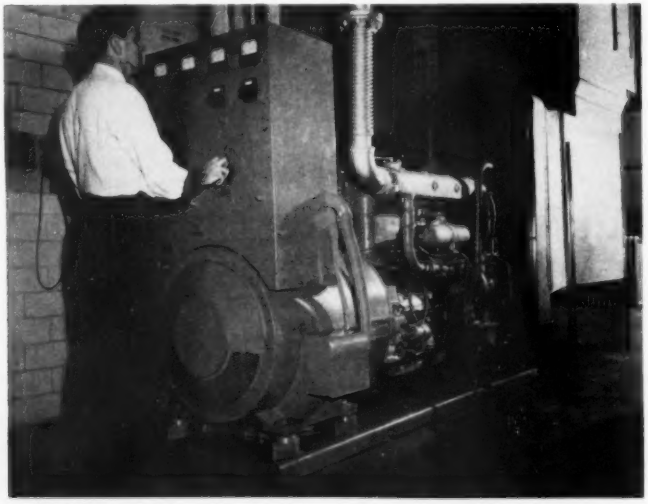
Winnipeg Water District Brush Control

THE Greater Winnipeg Water District owns and operates ninety-two miles of railway. This is located on the aqueduct right-of-way and has become heavily overgrown with brush, except for the narrow strip kept clear by a track mounted mowing machine. It is considered desirable, both from a railroad and an aqueduct maintenance standpoint to control this growth, which is made up of tamarac, spruce, swamp cedar, poplar, willow and berry bushes.

In July, 1950, the first attempt at chemical control was begun. The District used for fighting fires along its right-of-way a 7,500-gallon tank mounted on a steel frame car body and fitted with a Viking positive displacement style pump powered with a model "A" Ford motor. Changes were made to this car to adapt it for use in applying weed spray. Pipe connections were added to permit suction from either the tank car, or a drum or stream alongside, with discharge through either or all of three nozzle systems which were added to the tank car. These were: (1) twin outlets above each rail mounted beneath the car body so that fan shaped sprays would bracket each side of each rail for sterilizing the ballast section. (2) outlets terminating in short "play pipes" to which fire nozzles can be attached. (3) a 30-foot boom mounted on a turntable on top of the tank with ¾-inch nipples projecting from its lower side to which jointed nozzles can be attached. All spray systems were fitted with quick acting valves so that the spray volume and pattern could be changed at will. Sterilization of the ballast section had to be carried on as a separate operation as different chemicals were used.

Although this undertaking is still in the experimental stages, certain limitations have already been recognized. It was found that with the fire nozzle a spray could be thrown one hundred feet from the track but it was not economically possible to cover this width due to the large spray volume necessary to overcome even average winds, and due to the concentrated pattern of the sprays. Present efforts tend to the exclusive use of the 30-ft. boom, with the fire nozzle fitted to the upper play pipe being used only to douse occasional large trees. It is proposed to concentrate on the 150-ft. strip on the railway side of the aqueduct. If this can be controlled from the track it should then be possible to devise some means of spraying the remaining strip, perhaps with crawler mounted sprays travelling on top of the pipe and fed from the railway tank car.

Throughout the brush killing operations a standard mix of one chemical to 165 of water was used. This was the result of adding one drum of concentrate to a tank of water and was most handy in the field. The chemical used was 2,4-D having a strength of 3.6 pounds of acid content per gallon of concentrate.



● ***DIESEL standby engines, such as this, are used in telephone central offices. Engine here is getting regular weekly warm-up.***

How the SUNDAY PAPER CAN HELP IN PUBLIC RELATIONS

J. L. MORRISON,
Asst. Prof., UNC Journalism School
Chapel Hill, N. C.

WHEN leading engineers admit ruefully that their colleagues, by and large, do the world's worst job of selling themselves and their services to the public, then it may be high time for the engineer to take advantage of one of the easiest available mediums of reaching the public—the Sunday newspaper.

Engineers all over the world, accustomed to shortages of newsprint and skimpy newspapers, would jump at the public relations windfall offered by the hundreds of American Sunday newspapers, most of which weigh at least a couple of pounds apiece. Yet it can be truly said according to Prof. H. G. Baity, Head of the Dept. of Sanitary Engineering at the University of North Carolina, and a consultant to the Division of Environmental Sanitation, World Health Organization: "Engineers do poor public relations out of a sort of self-conceit. They act as if the truth of a matter always is self-evident to the layman."

Why Write?

Why should you—a waterworks superintendent, say—write for the Sunday papers? One advantage of such a medium is that your name on an article virtually guarantees its being published in any nearby paper. People will read almost any story which affects their daily lives. Another advantage of the Sunday newspaper medium, of course, is its wide readership. The Sunday newspaper is read by a wide cross-section of the population and by most members of the family.

It is a fact that the average reader, after graduation from high school or grade school, turns to the newspapers and magazines for his further education. Only a small proportion of the nation's 160,000,000 people ever go on to college. It should be remembered, too, that the Sunday paper, issued on the average man's day of leisure, is thoroughly and painstakingly read. A recent stream-pollution article by a North Carolina engineer, for instance, won state-wide attention because it appeared simultaneosuly in several of the state's Sunday papers. And the writer had to do nothing more than mail to the editors copies of a recent speech he had delivered. To add a final fillip of allure to an already attractive public relations idea, most editors pay from $5 to $15 for an article. They don't even mind the article's being submitted to a number of editors at the same time and receiving a carbon copy instead of the original.

Before going on to the specific "how to" of writing an article for the Sunday paper, it would be well to examine the pitfalls. Engineers have a way of lapsing into a language of their own, which leads up to Rule 1: Don't use even the most elementary engineering terms without defining them. If, for instance, an engineer writes that the city's water usage has risen to a new high of 150 GPCD, it would do him little good to explain that GPCD means gallons per capita per day. The average man would still protest: "Common sense will tell you that I, personally, don't use any 150 gallons of water per day; I'm no fish." It remains for the engineer to explain that the GPCD figure includes the city's total water consumption and covers, besides water used in households, water used in industrial processes, street washing, washing of cars, and even a certain amount in leakage and wastage.

Other pitfalls exist for the engineer-writer, but they can be avoided by the following simple rules. Rule 2 warns: Don't rest a case on rational deductions from data. Relate these deductions to the reader's comfort, convenience, or to accomplishing a certain task he wants done. Rule 3: Don't use illustrations which are too technical for the layman. In an article, especially, an effective photograph—even if it is more decorative than strictly illustrative—will direct more attention to an engineer-authored piece. Rule 4, and finally: Don't wax polysyllabic. Try, as a good exercise, writing a letter, say, in

which each sentence may contain only one word of more than one syllable.

Vocabularies May be Limited

Never forget the reader and his limited vocabulary. A wise city editor once had a sure-fire way of getting this point across. Whenever a young reporter brought him a story full of fine writing and purple prose, he would steer the youngster to the window of the city room and point to a truck at a nearby stop-light. "See that truck driver down there?" he would ask. "That man reads our paper all the time. Now go back and write this story for him."

Timing the appearance of a newspaper article is no particular problem; an engineer's article is always welcome in a newspaper office so long as the piece is relatively non-controversial. Then is "non-controversial" the joker? No, because the astute public engineer never waits for controversy to arise before writing a newspaper article. He anticipates future problems without waiting for a crisis. In other words, don't wait for a water shortage during a parched and dusty summer to point out the need for an expanded city water supply. Good public relations is something which is appreciated most when it is absent.

Assuming, now, that you have cleared with superiors the matter of publishing an article and have sold them on the long-range value of such contacts with the public, how is the article put together? "Put together" is a good expression to use, because writing a newspaper article is essentially a job of literary carpentry. The skillful artisan, of course, can turn out a first-rate job free-hand, but the average journeyman—carpenter or writer—needs at least a sketch, if not a blueprint, to guide him.

For the first writing stint of a waterworks superintendent, for instance, an article on the history of the city's water supply and its filtration plant is about the easiest subject imaginable. The writer can jot down briefly the various points he wants to make: 1. Comparison, old vs. new facilities; 2. Details of present plant, its attractive landscaping and the rest; 3. Population and industry, then and now, a comparison which suggests, 4. A look at the future; long-range need for an expanded water supply, and obvious need within five years of an enlarged filtration plant. These sections, when you get down to the actual writing, should be made to follow one another in a casual relationship and not as a conglomeration of unrelated facts. Paragraphs can be linked, for instance, by using such transitional expressions as "meantime," or "by the same token," or "therefore."

The Last Shall be First

The next step is to put the story in writing, according to the outline, but with one important exception; Item 4 becomes Item 1, or the "lead." The journalistic technique of the "lead" is that of taking the scientist's conclusion, always the last step in the investigative process, and placing it first. Always remember: conclusions first. Then, and only then, is it all right to explain how these conclusions were reached. Unless the conclusions do come first, the average reader will rarely stop to read the article in the first place. The lead, in other words, is an attention-getting device.

Optimum length for the Sunday newspaper article is about 1,000 words. One photograph, if obtainable, is desirable but not strictly necessary. Many amateur photographers show up on municipal, county and state payrolls and are willing confederates. Some governmental units, and all states, maintain tourist or industry-attracting bureaus which are excellent sources for free photographs. A local editor, assured that an acceptable article is at hand, often will provide a staff photographer to help out.

On page 1 of the article, type your name and address in the upper left-hand corner. In the upper right-hand corner, write first: Release Sunday, July 6, 1952. Beneath this, write: Caption for enclosed photo appears at bottom of last page. Beneath this, write: Waterworks history (or any brief tag for the story.) About a third of the way down page 1 indent for a paragraph and begin your story; no title, please, because the editor composes a headline to fit the space he has available. On page 2 and succeeding pages type in the upper left-hand corner: Waterworks history-Smith, or whatever your surname. The reason for this is that the various pages can be assembled if they should become separated in the composing room. At the end of your story place the symbol # and then, several spaces below, write in your caption for photo or photos. Using this pattern, page 4 should be the last page of your 1000-word article.

Submit Sunday articles by the calendar. Give thought to the publication target date and any added significance the story might have at that time. Mail the article flat, together with a piece of cardboard to keep the photo from bending, in a manila envelope. Manuscripts should be mailed first class and be in the mail 10 days before the date of intended publication. Address the envelope to the Sunday Editor of the paper or papers you choose. Don't bother with return postage; there is no point in having an editor mail back an unusable article of this type. By the same token, don't worry; Sunday editors usually are hard up for copy and welcome any article which makes a demonstrable point.

With millions of Americans ready to give them a respectful hearing, public engineers ought no longer neglect their public relations in general and the Sunday paper in particular. The average man *will* read something other than the comics and the sports pages in his Sunday paper. He will, that is, if you give him the chance.

A note from the Editor

Public Works also buys articles; and it pays more than the price Prof. Morrison quotes—for original exclusive articles. It does not pay for speeches, papers or carbon copies. Follow the excellent rules laid down in this article, and tell how you have done your job faster, better or cheaper; describe your new plant, or its operating results; or write us about any job that will help other men in your position. And don't forget photos.

• • •

Mexico Also Needs More Sanitary Engineers

There are about 3,000 water systems in Mexico, but only about 100 sewerage systems, according to the Department of Hydraulic Resources, of which Manuel Anava is chief of the Sanitary Engineering Division. Mexico now has only 25 sanitary engineers, but at least 300 more are urgently needed to carry out a sanitation program in a large part of the Republic. Many illnesses can be traced to polluted water and lack of sewerage facilities. It is estimated that deaths from such causes amount to about 6.5 per cent of the total deaths.

HOW GOVERNMENTAL FUNCTIONS WERE REALLOCATED in ANNEXATION

****

M. CLYDE HUGHES,

Associate Professor of Political Science, University of Georgia, in Public Management

****

OVERNIGHT, Atlanta, Ga., trebled its area and increased its population by 100,000. It annexed 82 square miles of Fulton County, giving the city a total area of 118 square miles and a 1950 population of 428,299. This took place last January 1, and coincident with it the city and the county reallocated certain governmental functions to eliminate overlapping and duplication. Some 800 county employees were transferred to the city and 250 city employees to the county.

Reallocation of Functions

Service functions of the city and county have been reallocated to place most of them exclusively under one government. The county is specifically forbidden to furnish those services allocated to the city, such as water, police, fire protection and garbage collection. The services placed under the city are:

1. *Water*—Atlanta continues to sell water to residents in unincorporated areas for a double fee and to nearby municipalities at wholesale. The city will extend its water mains at the rate of two miles per year for five years, or until the 82 square miles annexed have been serviced.

2. *Sewerage.*—The city may provide sewage disposal service to the county under contract.

3. *Police.*—The county police department was merged with the Atlanta Department. The county's crime laboratory became city property, along with finger-printing equipment and records, files and patrol cars. The county must make contracts with Atlanta for police protection, the cost to be paid through levies in police districts.

4. *Fire.*—The county fire department was merged with the Atlanta Department, but the county is authorized to create fire districts, assess the cost to the property owners and turn the money over to the city.

5. *Parks and Recreation.*—All parks and recreation facilities previously maintained within incorporated areas jointly by the county and the city were turned over to the municipality in which they are located. All other parks were turned over to Atlanta. The county will make contracts with Atlanta for the maintenance and management of parks in unincorporated areas. If the county does not pay the city for this service, the city may levy and collect a tax.

6. *Garbage collection.* A new department in the city is authorized to provide garbage collection for Atlanta. On contract with the county the city will operate 10 pick-up routes in unincorporated areas for a 90-day trial period. The county has agreed to pay $14 per year per residence served in the southern areas and $18 per year per residence served in the northern area. To defray the expense of this service, the county is authorized to create garbage collection districts and assessments will be levied against residences served.

Exclusive County Functions

All public health work in the county and city was assigned to the county. Atlanta citizens in DeKalb County are served by the health department of that county with respect to certain specified activities. County and city welfare services were merged into the Fulton County welfare department in 1934. This department continues to have exclusive jurisdiction over welfare services throughout the county.

Services Provided by Both

Some services continue to be rendered by each of the two governments:

1. With the annexation, the city officially took over 39 county schools with 17,000 pupils. The city had administered these schools under contract with the county since September 1, 1951. City and county teacher salaries and duties have already been qualified and curricula had been made identical. The county continues to operate its 46 schools.

2. The county is limited in road and street building and maintenance to the unincorporated areas; and only work essential to the county road system can be done. The planning commission has authority to determine whether a proposed road or street is essential to the system.

The city is prohibited from constructing or maintaining streets or roads in private subdivisions or residential projects unless the total cost is to be borne by the property owners except upon the certification of the planning commission.

3. The traditional law enforcement activities of the county sheriff are continued. 4. The Atlanta-Fulton County Planning Board is directed to make a master zoning plan for Atlanta and all unincorporated areas in the county. This Board represents a merger of the former Fulton County Planning Committee and the Atlanta Planning Commission and the two corresponding boards of zoning appeals.

5. The Metropolitan Planning Commission of Fulton and DeKalb Counties, originally set up in 1947 to draw up a master plan for the physical development of the areas under its jurisdiction, is continued, and is responsible for long-range planning of independent communities in the metropolitan areas.

• • •

Advertising Campaign Will Try to Recruit Engineers

The current critical shortage of engineers has prompted the Advertising Council to initiate an advertising campaign to urge qualified high school students to consider engineering as a career. The campaign will point out the opportunities that exist in engineering and the advantages of an engineering training in qualifying young men for positions of leadership in many fields.

Dustless Chemical Handling for a WATER TREATMENT PLANT

A CAR of oyster shell lime is handled at Station C of the New Orleans Sewerage and Water Board about every three weeks. This lime is used in water treatment. The car contains 45 to 50 tons, and up to about two years ago, unloading was by hand, using wheelbarrows. It took a crew of four men about 40 hours to unload a car and the cost ranged up to $2.50 per ton. In addition to the dust and dirt, it was not always convenient to have the men at hand just at the time the car was pushed on the siding. So demurrage often added to the cost.

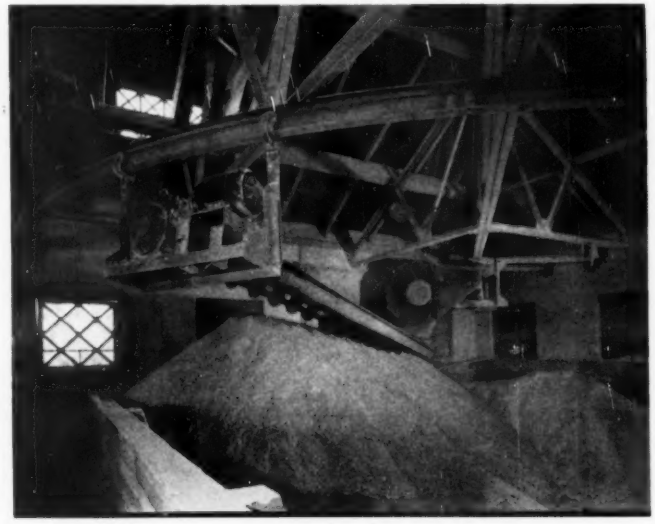
To overcome all of these objections and difficulties, a Link-Belt conveyor system was installed to handle the lime, automatically and continuously, direct from the hopper bottom outlets of the cars to the chemical storage bins on the upper floor of the chemical house. The conveyor operates within a steel casing, so there is no dust anywhere in the building. Housekeeping is easier; the cost of handling has been reduced; and demurrage is a thing of the past. Push-button operation has replaced hand methods.

The Conveyor System

The new system consists of the following: A combined-run conveyor-elevator which consists of a horizontal loading section installed in a pit under the railroad track, followed by a steeply inclined section which elevates the lime 15 ft. to a hopper. The horizontal section is 13 ft. long and the inclined section is 35 ft. long. From the hopper, an 86-ft. long conveyor-elevator deposits the lime into a hopper at the storage bins. This conveyor is set to work at an inclination of about 18°. Supporting steelwork is necessary. At the storage bins, a pivoted, inclined, screw-conveyor, 19 ft. long, with the outer end suspended on a curved I-beam track, distributes the lime to the various portions of the bin. This screw conveyor is 19 ft. long and the screw is 12-inch diameter Helicoid operating in the open, without a conveyor trough.

The rated capacity of this installation is 10 tons per hour. Power for operation is by motor at the head shaft of each of the two conveyor-elevators, and by motor at the head of the screw conveyor, driving not only the screw but operating the trolley to insure proper distribution. The conveyor flights fill practically the entire area of the casings in which they operate, thus keeping the material enclosed at all times.

The General Superintendent of the New Orleans Sewerage and Water Board is A. B. Wood. The equipment was installed through the R. J. Tricon Co., Link-Belt distributors in New Orleans.



• ***OPEN bottom conveyor on curved track distributes lime in bin.***

• ***CAR containing oyster shell lime is spotted over hopper from which conveyor elevator combination raises lime to storage bins.***

WHY BUY FROM YOUR WHOLESALER?

Unless you have some insight into your wholesaler's operations, you cannot fully comprehend the value of his acquaintance and what a real opportunity you have to share in his experiences and knowledge.

You cannot have a better source for genuine help than your wholesaler provides. Consider him a part of your family. He is strategically situated to have an over-all view of your industry's operations. Aside from stocking and selling the merchandise you want, he serves also as a clearing house for ideas.

Make it a point to get well acquainted with your wholesaler. Let him show you how you can do a better merchandising job under these abnormal conditions.

With most supplies at low ebb, you and your wholesaler face the situation of spending less time in the actual selling of goods. This can prove to be a fortunate change in your routine activities. It affords a genuine opportunity for you to utilize this newly created time to do another kind of selling.

Since you are really a specialist—held in high esteem in your community—who uses only approved materials that conform to the accepted plumbing codes (that includes Wolverine tube, of course)—you might take a new look on your service set-up and see if you can uncover some new and improved ways of broadening your operations and "selling yourself" to more people.

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Television for Explaining City Government Functions

A weekly television program of half an hour has been inaugurated by Kansas City, Mo., the show to go on late Sunday evening. Each department of the city government is scheduled to present its activities in a half-hour program.

• • •

Texas Water Works

(*Continued from page* 45)

Good advice on getting ready to lay water pipe was presented by E. Whidden, water superintendent of Bellaire. Proper preparatory planning will include: Careful determination of precisely where the pipe is to be laid; laying beneath pavement should be avoided if possible, due to the cost of replacing the paving material. Soil conditions should be determined before deciding on the type of pipe to be laid; in corrosive soil, for instance, it may be desirable to use Transite. The overall construction program should be planned so that the proper number of workmen will be at hand and the tools they need will be available. A valve or tapping sleeve should be placed at each junction. Water lines must be kept adequately separated from sewer lines. Materials should be delivered and inspected before work begins.

Skimping by buying shoddy materials is certain to result in a final higher cost. In bidding, at least two contractors' bids should be considered. Manufacturers' instructions should be followed in laying pipe and in using joint material. Bell holes for bell and spigot pipe should be large enough to permit proper calking of joints. In calking, an air hammer will soon pay for itself.

Water Usage and Conservation

The moderator of this meeting was R. H. Weiss and the panel consisted of W. D. Asbury, E. J. Umbenhauer and C. C. Cason, the latter two from El Paso. The discussion related mainly to conditions in that city.

The extent of water usage depends on the following: climate, extent of metering, availability of sanitary sewer service, pressure, rates, population and type usage such as residential-commercial or industrial. In considering the effect of climate on water usage, two features stand out which contribute to greater use in an arid area and also to a higher seasonal use. These

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Meeting Vacation-Time Water Demands

with a Horton Elevated Tank

When summer comes to Windham Center — in the heart of Maine's Sebago Lake resort area — vacationers come also. This summer rise in population sharply increases water consumption . . . in the month of July almost six times as much water is consumed as in February. Such greatly increased water demand necessarily strains facilities.

Because of this severe seasonal variation in water consumption and to combat low water pressure efficiently and economically, the Portland Water District recently installed a 200,000-gal. Horton elevated tank at Windham Center. This modern welded steel structure doubled the existing elevated storage capacity in the system.

Elevated water storage means dependable, gravity pressure without excessive pumping costs. Installation of an elevated tank will help meet increased demands and often help lower fire insurance ratings.

Horton elevated tanks with ellipsoidal-bottoms are built in standard capacities from 15,000 to 500,000 gallons. Tanks with radial cone-bottoms are built in standard capacities from 500,000 to 3,000,000 gallons.

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Right: 200,000-gal. ellipsoidal-bottom tank, 79 ft. to bottom, built for the Portland Water District in the Windham Center, Maine, water system.

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Detroit 26	1536 Lafayette Bldg.	Tulsa 3	1641 Hunt Bldg.
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are lawn sprinkling and the use of evaporative type air conditioners. Granted, in arid areas individuals may drink slightly more and take more baths, this increase is negligible when compared to the increase because of lawn sprinkling and air conditioners.

Since water is not abundant, and water usage is rather high, conservation measures must be undertaken. Methods of conservation in an arid area are generally the same as in any other. Metering, inspecting for leaks, educating the public in conservation of water by proper use, and eliminating waste are standard methods—but the two most important uses to control in an arid area are lawn sprinkling and air conditioners.

In some places, a graduated water bill has been fairly successful. Conservation by rates, regulations and ordinances are being used in many places; but, as previously mentioned, the most important control or conservation in an arid area should apply to air conditioners and lawn sprinkling. During recent years there has been a tremendous increase in the use of air conditioning, and of refrigeration equipment, and this has placed a considerable additional demand on water works facilities.

Evaporative coolers have become very popular in some areas and because of the great numbers in use where they perform successfully, their accumulated water demand is very noticeable. The city of El Paso amended its Air Conditioning, Refrigeration, Ventilation and Evaporative Cooling Code in May, 1951, to require that all evaporative coolers of capacity over 1,800 cubic feet of air per minute be equipped with a recirculating pump. Although the recirculating pump adds to the cost of the equipment, there are considerable benefits obtained in a lower cooling of the air, more economical operation and a considerable saving in water.

The determination of the amount of water used for sprinkling or irrigating lawns from a domestic water supply is nearly always a difficult matter, because metering, where such is used, does not differentiate between the various uses to which the water passing the meter is put. Using records of the Department of Water and Sewerage at El Paso, an attempt has been made to make such an estimate of the use of water on lawns in El Paso, which lies in an arid region, and probably has a higher per capita use for this purpose than any city in Texas. It is estimated that water poured on the lawns in 1950 accounted for one-fourth to one-fifth of all water used per year. If this percentage of water usage were distributed evenly over the entire year, it would create no particular problem in water distribution, but since both irrigation and air conditioning are concentrated heavily in the summer months, there is a large seasonal variation in demand. In single residences with lawns in El Paso, June usage was at 3.39 times the rate of the minimum month.

There are three steps in the limiting process of water usage for lawn irrigation. The first is to eliminate all possible waste, whether from overuse, wastage into streets, of from evaporation or other causes. The second is to limit the type and amount of vegetation that can be grown, or the total amount of water that can be used. The third step is to eliminate or prohibit the use of water for sprinkling entirely.

When we speak of eliminating waste, we entail and assume a two-fold burden—that of public information and education, and that of ac-

HOW YOU CAN GET NEW PIPE EFFICIENCY FOR 25% OF THE COST OF LAYING NEW PIPE

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FAST: Up to 1000 feet of pipe can be cleaned and lined in ONE DAY

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SAFE: The Pittsburgh-Eric Process leaves the pipe free of contamination. No taste or odor is imparted to the water; a brief flushing period with clear water leaves the pipe ready for use.

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LOW COST: Depending on the area, the cost of reconditioning by the Pittsburgh-Eric Process is only 25 to 40% of the cost of laying new pipe.

LONG LIVED. The lining material, LECTUMEN, used in the Pittsburgh-Eric Process has high resistance to water and the chemicals used in water. More than ONE MILLION feet of pipe, reconditioned by this process ten or more years ago, is still giving efficient service.

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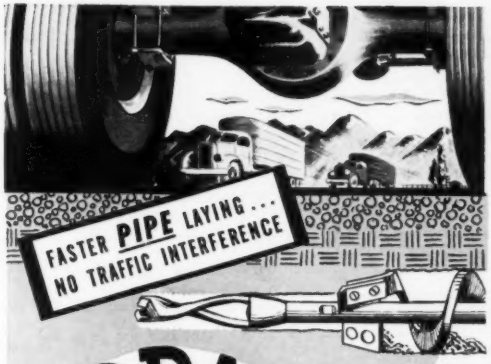

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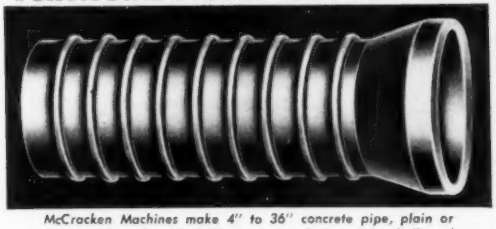

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quiring public sympathy. The latter entails good press relations. The former covers a large amount of territory. The public must be told how much water is necessary to support vegetation, when and how to water in order to avoid evaporation losses, and in some cases how to treat the soil in order to cut water losses. Obviously, water covering sidewalks and running down city streets represents wasted water.

The limitation of the amount of water used for watering is a serious problem, since it is, in a sense, rationing. It is axiomatic that no rationing will work without the cooperation of the public, and that no system of rationing is any better than the policing available. It is therefore best to keep the method simple, in order to accomplish both aims. There are many systems available, most of which have serious drawbacks. A few of the most common follow: (1) Limit the amount and type of vegetation to be grown; this would require enforcement and inspection beyond the means of most cities; (2) Limit the days or hours during which watering can be done; this is probably the easiest to enforce, because watering has to be done in the open. (3) Limit the amount of water to be used; but how do you tell where water is used? and where do you get enough meter readers to enforce? (4) Limit indirectly the amount of water used by making larger amounts of water cost more per unit than smaller amounts of water. Final selection of the method to be used must be based on local conditions.

• • •

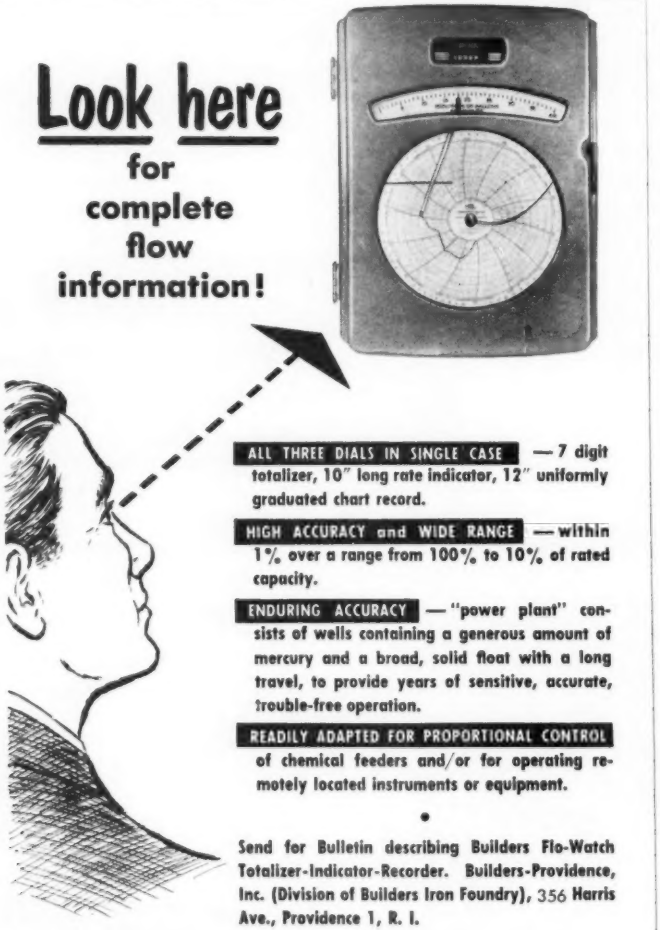
Florida Widening

(*Continued from page* 44)

suitable material. In days past Florida had a problem of roads sinking because the muck had not been removed.

Close supervision over all jobs is exercised by the State Road Department, which has its main offices in Tallahassee but is represented by district offices throughout the state. On the Live Oak job above referred to the project engineer was Noidre Moses and the district engineer J. A. Brewer, stationed at Lake City. On the Monticello section the work was supervised by Sam Register, project engineer, and George Dickinson, district engineer at Chipley. These two also supervised the two stretches on State Road 20. Overall supervision is exercised by Sam Turnbull, chief engineer, with offices in Tallahassee.

The Florida State Road Department generally does not specify exact equipment that is to be used on its jobs, leaving it to the road contractors to use such equipment as is necessary to perform the work so that the end results will meet the contract specifications. Barber-Greene asphalt machines have been generally used in road widening work where the wearing surface is asphaltic concrete. The Apsco spreader is being widely used for placing material in trenches. For mixing concrete for the widening strips between Live Oak and the Suwannee River, the Jaxon Construction Co. of Jacksonville used a truck-mounted concrete mixer with a skip mounted on the front which runs on a track over the cab. This is manufactured by Mixermobile. For some trench compacting operations, Faulk & Coleman used a tractor with a wide diameter wheel on one side with bolted and welded feet similar to a sheepsfoot roller. This was designed and built by the personnel of the company.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SCHEMES SUGGESTED FOR SMOG CONTROL IN THE LOS ANGELES AREA

Vigorous proposals have been put forth from time to time by experts and others for elimination of smog conditions in the Los Angeles area. Some of these are listed in an article "Smog Lore" by R. D. Cadle and H. C. Wohlers of the Stanford Research Institute in *Air Repair* which is published by the Air Pollution and Smoke Prevention Association of America. The following are from the above article.

One widely suggested method, which has received a considerable amount of attention, consists essentially of blowing smog out of the Los Angeles basin by one or another means.

A meteorologist suggested an "aerial sewage disposal system" to eliminate smog. This would consist of a series of stacks built atop hills in the area. These stacks would rise high enough to penetrate the inversion layer (often at a height between 500 and 2,500 feet) so that the smog clouds could be vented to the giant spaces above.

Other persons have suggested building such stacks, not necessarily on hilltops, but in such a manner that a natural draft would sweep up through the vents. A variation on this cure-all involves drilling tunnels through the mountains separating Los Angeles from the Mojave Desert. Huge fans placed in the tunnels would draw the smog from over the basin and blow it out on the desert.

Many Difficulties

There are many difficulties in carrying out any such scheme. We calculate that about 180 cubic miles of air must be moved daily. If the proposed vents had a cross-sectional area equivalent to one city block, and if 12 vents were used, air would have to be forced up these vents at a velocity of more than 75 miles per hour, if the entire volume of air is to be removed within 24 hours.

This, in itself, would be no mean trick.

In addition, engineers at Stanford Research Institute calculated that the heat required to break through the inversion layer would possibly take the energy of 3,500,000 barrels of fuel oil. This is roughly seven times the amount of fuel handled by the combined refineries each day in the Los Angeles area.

Paint Roofs Black

In view of Los Angeles' reputation for sunlight, it is not surprising that one person, at least, suggested that heat from the sun be used to help dispel the smog. It was proposed that roof tops in the city, and perhaps streets and sidewalks as well, should be painted black.

The idea was that the heat absorbed would create huge turbulent currents in the air which would somehow dispel the smog.

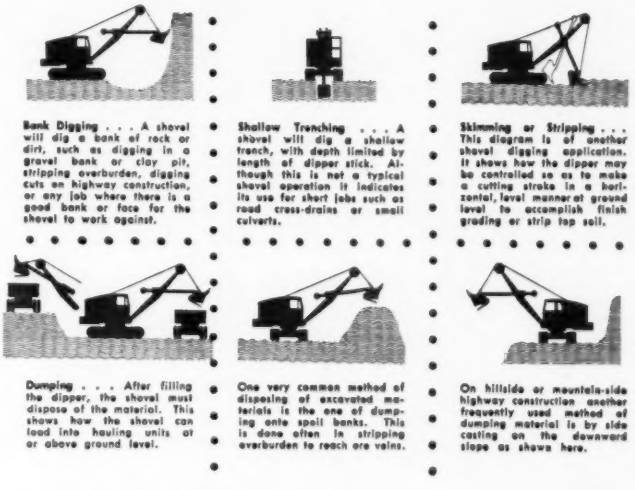
A similar suggestion was made in a more grandiose style. The sides of the mountains flanking the basin at certain strategic points would be covered with a series of reversible sections similar to the slats on venetian blinds. Each section would be highly polished aluminum on one side and would be painted black on the other.

These sections could be flipped over electrically from a central location. When the polished surface glittered in the sun, a wind would be created, according to the theory, which would blow pollutants away and over the mountains.

An imaginative solution was to rid the city of its open-burning garbage dumps by boring a hole down through the side of one of the mountains rimming the basin until the heat of the earth's center is tapped.

This hole would act as the chimney of this garbage disposal unit. The volcanic furnace could then be used for burning the city's rubbish and garbage. The cost of setting up this system, it was explained, would be paid for by the steam and electricity generated by the burning of the garbage.

TYPICAL WAYS TO USE A SHOVEL



Bank Digging . . . A shovel will dig a bank of rock or dirt, such as digging in a gravel bank or clay pit, stripping overburden, digging cuts on highway construction, or any job where there is a good bank or face for the shovel to work against.

Shallow Trenching . . . A shovel will dig a shallow trench, with depth limited by length of dipper stick. Although this is not a typical shovel operation it indicates its use for short jobs such as road cross-drains or small culverts.

Skimming or Stripping . . . This diagram is of another shovel digging application. It shows how the dipper may be controlled so as to make a cutting stroke in a horizontal, level manner at ground level to accomplish finish grading or strip top soil.

Dumping . . . After filling the dipper, the shovel must dispose of the material. This shows how the shovel can load into hauling units at or above ground level.

One very common method of disposing of excavated materials is the one of dumping onto spoil banks. This is done often in stripping overburden to reach ore veins.

On hillside or mountain-side highway construction another frequently used method of dumping material is by side casting on the downward slope as shown here.

The six illustrations above show various ways of using a power shovel to advantage. They were sent us by the Thew Shovel Co., along with a most attractive model of a Lorain shovel, made by Thew. This Lorain model uses threads instead of wire ropes, and hand-powered cranks instead of engines; but it can do most of the things that the illustrations above show. The scale of this model is one-twenty-fourth actual size. Bucket capacity is about 4 cu. ins. The model is made by Reuhl Products, Inc., 4505 Belt Line Highway, Rt. 3, Madison, Wisc.

Sludge Filtration

(Continued from page 56)

that further studies on operations of this plant might indicate that chemical dosage could be reduced. Considering the small amount of sludge filtered at this plant, the cost of chemicals, even if overdosage is practiced, is not high.

The low vacuum on the filter is the result of breakthrough of air in the cake. Both by sound and visual observation, it was apparent that the quantity of air passing through the cracks in the cake was considerable. Inasmuch as the primary purpose at Liberty is to produce a cake that can be handled, no effort has been made to increase the vacuum or reduce the moisture content of the sludge cake. In other installations of these Komline-Sanderson filters, operation produces both higher vacuum and drier sludge cake.

In spite of the high moisture content of the sludge cake, the production of dry solids per unit area of filter is quite satisfactory. One of the reasons is that a particularly thick cake is picked up. In this instance, the production of 10 lb. of sludge cake (dry) per sq ft. per hr. is highly satisfactory. This calculation is based on the method of rating vacuum filters according to production per unit area per hour. A more recent concept of rating filters considers the actual total area used for filtering in an hour, i.e. the area times the revolutions per hour. On this basis the production of 0.5 lb. per sq. ft. of filter area exposed per hour is high.

Suspended solids discharged with the filtrate and wash waters are returned to the incoming raw sewage and in this case amounted to approximately 1.2 per cent of the total solids entering the vacuum filter tub. The volume of wash water used amounted to 17 per cent as much as the filtrate volume. As neither the suspended solids in the filtrate nor the filtrate liquor volume is important in this plant, no attempt has been made to reduce these quantities. Experience elsewhere indicates that both can be reduced.

The attempt was made to operate without washing the coiled springs, but it was obvious that this could not be done.

On the basis of connected horsepower, the total power required is 0.153 hp. per sq. ft. of filter area or 0.0767 hp. per sq. ft. of surface under vacuum. This latter value is low for vacuum filters.

The writers wish to acknowledge the aid and assistance in the collection of these data of Walter H. Brown, Application Engineer, Builders-Providence Inc. and Henry Munroe, Sanitary Engineer, Proportioneers, Inc., Providence, R. I. and to Thos. Komline of Komline-Sanderson Engineering Co. for his review of the section on operation of the vacuum filter.

• • •

Foaming, Frothing or Sudsing?

Proper nomenclature to describe the formation of foam in aeration tanks and similar places is important, according to Clarence Klassen's Illinois Digester. Because the term "foaming" has been used to designate such action in digesters, it should not be used to describe a foaming condition in aerators. The terms "sudsing" or "frothing" are used instead, these having been arbitrarily selected during experimental work in Texas.

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PUBLIC WORKS DIGESTS

THIS section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

SEWERAGE AND REFUSE . . 72
HIGHWAYS AND AIRPORTS . . 78
WATER WORKS . . 84

THE SEWERAGE AND REFUSE DIGEST

1951 Literature on Treatment of Sewage and Wastes

In reporting on the literature on this subject which appeared during 1951, the Committee of the Federation of Sewage and Industrial Wastes Associations covered an all-time high number of articles: 201 on sewage treatment, 164 on industrial wastes, 94 on radioactivity, and 256 on water pollution. These included foreign as well as American literature. Special attention is called to studies on the activated sludge process—loads up to 220 lb. per 1,000 cu. ft. of tank, more than 3 times the loadings considered practicable a few years ago; flotation concentration of sludge; phenol oxidation by use of chlorine; vegetable contamination and decontamination when using sewage for irrigation; recovery of vitamins from sludge; the membrane bacteria filter in making analyses; stream quality standards rather than effluent quality; and service charges for sewage and industrial wastes.

"A Critical Review of the Literature of 1951 on Sewage, Waste Treatment, and Water Pollution;" *Sewage and Industrial Wastes*, May.

Hydraulics Of Sewers

The author presents a thorough discussion of the flow of sewage in both sanitary and storm sewers, including modifications of the old established formulas to permit practical use of data and ideas resulting from recent tests and measurements. Among these is the demonstration that, for a given character of wall surface, the value of n in Manning's formula is greater for large pipes than for small ones—contrary to former belief. Also experiments have shown that the value of n for a pipe flowing partially full is greater than for a full pipe, and that velocity at half depth is only 0.8 that at full depth. Less velocity is required for self cleansing a partially full pipe than for a full pipe. A detailed discussion of flow at transition points and junctions is given. Several diagrams are given permitting ready application of these ideas in designing a sewer system, without tedious solving of equations.

Thomas R. Camp—"Hydraulics of Sewers;" *PUBLIC WORKS*, June.

Bacteria in Sand Filters

Studies of bacteria in intermittent sand filters are being made at the Sanitary Research Laboratory of the University of Florida, "to advance the fundamental knowledge of sewage treatment in general and of intermittent sand filtration specifically." The filters reported on in this paper were composed of sand with an effective size of 0.31 mm and uniformity coefficient of 3.3, regularly dosed with sewage which varied in strength from 60 to 120 ppm B.O.D. Increase in dosing rate markedly increased bacterial population, of which 14 species were isolated. The predominant types were members of the genera *Flavobacterium* and *Bacillus*, the former predominating with higher dosing rates, the *Bacillus* at the lower rates. In most cases zooglea-forming bacteria outnumbered the others in the upper 12 in. of sand. The number of coliform organisms was greatest near the surface, decreasing with the depth. Fecal streptococci in the final effluent were practically as numerous as in the primary sewage. No results obtained supported the view that decreases in enteric bacteria by sewage filters are due to the presence of antibiotic-producing microorganisms.

W. T. Calaway, W. R. Carroll and S. K. Long—"Heterotrophic Bacteria Encountered in Intermittent Sand Filtration of Sewage;" *Sewage and Industrial Wastes*, May.

Feeding Garbage to Hogs in California

Throughout southern California, the feeding of household garbage to hogs has been standard practice for generations. Los Angeles disposed of its 500 to 600 tons of garbage a day at the largest hog ranch in the world until last September, when San Bernardino, Co., in which it was located, made it illegal to ship garbage into it from outside communities. Then the hog farms were moved to a rugged and relatively isolated area 20 miles north of Los Angeles, where they are operated by a syndicate of five operators. The largest of these owns 190 acres on which it feeds about 10,000 hogs, using 100 tons of garbage from Los Angeles, 50 tons from Pasadena and 20 from other sources. Water-tight trailers of 15 to 18 tons capacity are filled by collection trucks, and haul the garbage to the farm, where it is forked onto concrete feeding pens. The garbage is not cooked; some of it may be 3 or 4 days old. The platforms are cleaned every

two or three days, the uneaten garbage and manure being buried. The place is kept "relatively" clean and inoffensive, but there is plenty of evidence of what it is. This farm markets about 100 hogs a week the year around. As the city is paid for the garbage in addition to being relieved of the cost of disposing of it otherwise, it will probably continue the present method so long as any neighboring county will permit the garbage being brought into it for this purpose.

Winston R. Updegraff—"How and Why Municipal Garbage Feeds 10,000 Hogs;" *Western City*, April.

Composting Garbage To Produce Organic Fertilizer

The author describes a "composter" designed to produce the maximum amounts of solid and liquid fertilizer from garbage, together with, if desired, not more than 15% of digested sewage sludge. The material is ground, after metals and bottles have been removed, and discharged through a closed conveyor into a concrete silo about 18 ft. high, built of concrete blocks provided with 2-in. aeration holes. The floor is of concrete, perforated with holes to permit the liquid from the garbage to drain into a well beneath. The silo is surrounded by another concrete tower with aeration ports, screened to prevent the access of rats and other vermin. A specially developed bacterial culture is mixed with the liquid in the well and this is then pumped into the garbage through a perforated pipe set vertically inside silo, the garbage being kept damp but not saturated. Composting is completed in about 28 days, producing an inoffensive humus free of any weed seeds and, in the well, a highly concentrated liquid fertilizer.

Ralph J. Kenyon—"A New Method of Garbage Disposal by Composting;" *PUBLIC WORKS*, June.

Shallow Clarifier At a Small Plant

A sewage plant at Wheatridge, on the boundary of Denver, Colo., was designed for trickling filter treatment of the sewage from 1250 houses. The most interesting feature is the clarifier, which was designed on a surface-area basis. It has a uniform depth of only 4 ft. and diameter of 42 ft. In the center is a well 6 ft. in diameter into which the sewage enters. From this it overflows into the surrounding annular settling chamber; and from this over a steel overflow weir one foot inside the outside wall, therefore about 66 ft. long. In the bottom of the settling chamber is a trench leading from the central well to a sludge well outside the clarifier. A sludge scraping mechanism scrapes all sludge into this trench at each revolution, or about 15-minute intervals. In this trench or trough, which is 12 in. deep, is a screw conveyor which operates continuously, pushing the sludge into the sludge pit. Suspended-solids tests of grab samples taken at peak flows show consistent removal of 60 to 70%.

Carroll H. Coberly—"Shallow Clarifier at Wheatridge, Colo.; *Sewage and Industrial Wastes*, May.

Copper Sulfate And Septic Tanks

It has become more or less common practice to introduce copper sulfate into sewers to kill tree roots which have intruded there; and there seems to be no evidence that the copper sulfate has any effect on the operation of treatment

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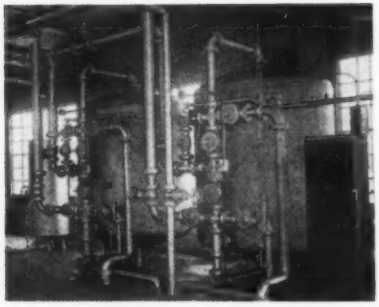

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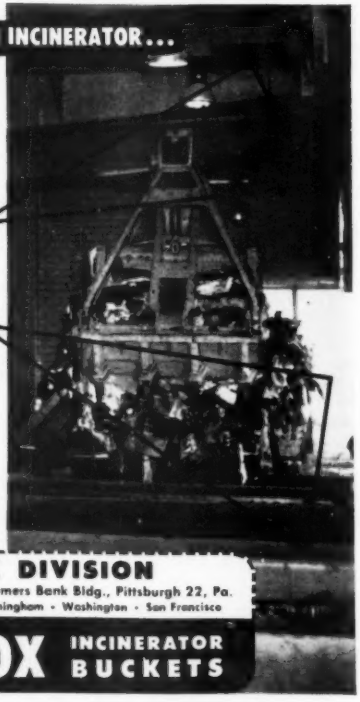

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plants. The question was raised whether the same would be true of septic tanks, and tests were made at Purdue University to answer it. The conclusion reached was that a copper sulfate dosage of at least 3200 ppm will not interfere with volatile solids reduction in an ordinary septic tank. If the dosage is not applied more often than once every four months, a copper sulfate dosage of 800 ppm (2 lb. in a 300-gal. tank) has practically no effect upon production of gas or upon volatile solids reduction in a septic tank.

Don E. Bloodgood—"Tree Roots, Copper Sulfate and Septic Tanks;" *Water & Sewage Works*, May.

Froth, Foam and Syndets

Sewage and Industrial Wastes, with the aim of precluding confusion in terminology in discussions relating to "syndets" (synthetic detergents), will use the word "froth" in referring to the aeration tank problem as distinguished from the "foam" problem at sludge digestion units.

At the treatment plant of San Antonio, Tex., studies have been made of two points in connection with frothing: How can the formation of froth be controlled?, and do syndets contribute to frothing? Concerning the second question, it has been concluded that the addition of even high concentrations of syndets do not cause troublesome frothing; that what frothing did occur when syndets were added at the plant, formed at the point of addition and dissipated rapidly as the sewage moved toward the outlet. On the other hand, natural frothing is non-existent at the influent and reaches a peak near the effluent. At no time, when high concentrations of syndets were added to the sewage for test purposes, did it have any adverse effect on plant operation.

Frothing is kept under control by maintaining the amount of the suspended solids in the mixed liquor above the 1400 ppm level—generally 2,000 to 3,000 to provide a margin of safety. "It was possible to make or prevent froth at will by decreasing or increasing the suspended solids."

W. N. Wells and C. H. Scherer—"Froth Formation and Synthetic Detergents;" *Sewage and Industrial Wastes*, May.

(Commenting on the above editorially, W. H. Wisely says: The re-

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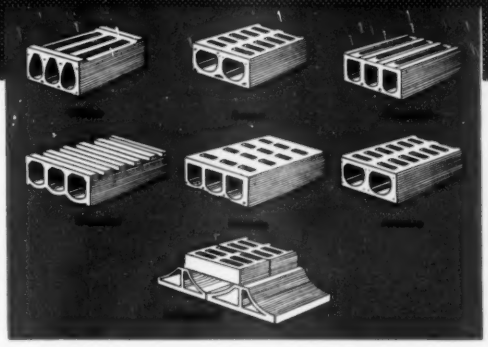

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sults at San Antonio do not "whitewash" synthetic detergents as the cause of aeration tanksuds. Many activated sludge plants operated with low mixed liquor solids prior to 1940 without the voluminous froth that is frequently encountered today.)

Control of Frothing

At the Motherwell, England, diffused air activated sludge plant, frothing 5 or 6 ft. high above water level has been successfully controlled by applying small quantities of mineral lubricating oil to the aeration tanks. At Cranston, R. I., a fluffy froth is common at the normal suspended solids content of 1250 ppm but does not appear when solids level is raised to 3,000 to 3,500 ppm. When it does appear, it disappears rapidly when "Depuma", a defoaming agent, is added. New York City uses "Swifts Sanitary Defoamer", another defoaming agent. Use of water sprays does not seem to be completely satisfactory.

"Tips and Quips:" *Sewage and Industrial Wastes*, May.

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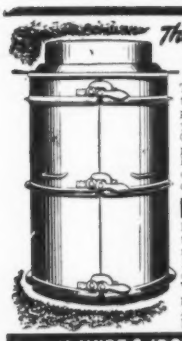

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Basic Principles of Detergency. By *Rolf Eliassen*, Prof. of San. Eng., Mass. Inst. of Tech. May, Pp. 208-209.

A New Plastic Base Sewer Jointing Compound. By *Raymond B. Seymour, Walter R. Pascoe* and *Robert H. Steiner*, Atlas Mineral Prod. Co. May, Pp. 210-216.

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NO DIAMONDS FOUND IN DIGESTER CLEANOUT

Fred C. Feltz,

Operator, McHenry, Illinois, In the "Operator"

AFTER fifteen years of operation, it was known that the digester at the McHenry plant needed cleaning to remove accumulations other than sludge. With a little planning the operation was started early in November, 1951. Digestion takes place in a five-compartment tank 20 ft. by 32 ft. by 18 ft. deep, each hopper equipped with a valved draw-off pipe leading to the sludge drying beds. Wood planks are used for covering the tank.

First, we pumped out all the liquid and sludge that the pump would draw, and that left about five feet of solids in the tank. Then with a small shovel equipped with a ¼-yd. clam shell bucket we removed the remainder of the solids. Because the clam-shovel was mounted on a boom, it was possible to swing each load to fill in low ground about ten feet from the digester.

Lime was spread on the solids to control any odors, and the entire fill will be covered with dirt. There were no diamonds, money, or rubies in the solids but there was plenty of sand and other things the public puts in sewers. The job took four days and we considered the operation a success.

• • •

Sludge Bed Operation with Annual Cleaning

As an experiment, at the Sanitary Engineering Research Laboratory at the University of Florida, sludge from an Imhoff tank was applied repeatedly to a drying bed without removing the previous loading. This procedure was continued for a year. The material appeared to dry without difficulty, though the rate of dewatering was slower. When finally removed, the moisture content of the sludge was about 75 per cent, the sludge was forkable and the texture was uniform throughout the entire depth. Objections included development of a noticeable odor after rains and the sludge cake became a breeding place for psychoda.

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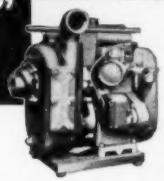

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PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Early Opening of Concrete Pavements

California specifications for high-early-strength concrete provide for adding 2 extra sacks of cement to the regular 5-sack pavement concrete. Improper balancing of the ratio of water to cement sometimes gave less early strength than was desired. In a recent contract, 1 to 2% of flaked calcium chloride was substituted for the extra 2 sacks of cement, giving comparable strength at about one-fifth the additional cost, and lower shrinkage than that characteristic of the richer mixtures.

In laying concrete pavements, California prolongs the final finish by intermittent surface manipulation until the maximum subsidence has taken place. This gives improved riding qualities and a nonskid surface. Concrete treated with calcium chloride hardens rapidly after the final passes of the drag finisher, and the effective period available for the steel cut float used in the final finish is reduced. At the age of 7 days the treated concrete had 30% higher compressive strength than the untreated, but at 28 days there was little difference.

Carl Alzueta—"Concrete Paving: Calcium Chloride Admixture Expedites Opening Pavement to Traffic;" *California Highways*, April.

Iowa's Stop-Gap Resurfacing Program

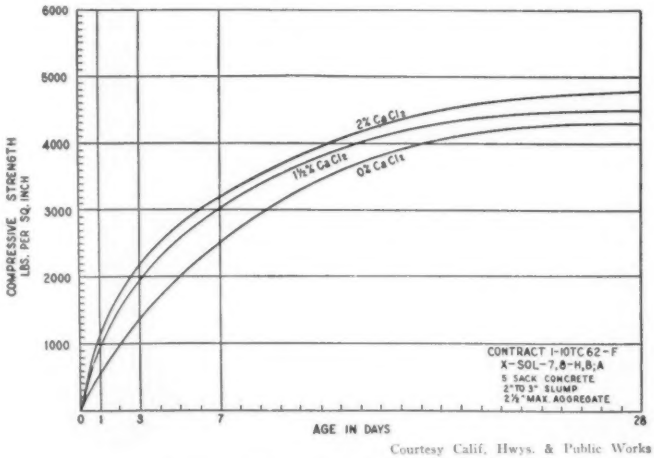
The spring break-up of 1951 was the worst that Iowa had experienced for fifteen years, and it found 1,000 miles of concrete pavements in bad condition. At the rate at which the state had been resurfacing under its reconstruction program, it would take 22 years to rehabilitate these thousand miles. It therefore adopted a more rapid stop-gap program, resurfacing the 1,000 miles with 3 in. of hot-mix bituminous concrete, in two 1½-in. courses; no widening, grade reduction or alignment changes. Last summer 541.6 miles of this type of surfacing was placed under contract, 130 miles completed before winter, and the commission expects to complete about 500 miles in 1952 and, the rest of the 1,000 miles in 1953. The average cost last year was $15,290 per mile, including $1,137 for patching and $425 for shoulders. During 1948-51, the high-type widening and resurfacing done with bituminous concrete had cost about $37,000 per mile; and that done with 6-in. portland cement concrete, $52,000, and totaled 134.3 miles for the three years.

Walter H. Root—"Iowa's Stop-Gap Resurfacing Program Speeds Highway Improvement;" *Civil Engineering*, June.

Jets, Rockets and Airfield Pavements

No longer can an airfield pavement be considered as merely a high-grade highway pavement; especially when it is to be used by jet or rocket aircraft. Jets cause terrific air blasts, intense heat, and high shear action when they land. The blast of gas from a jet engine may reach 1800° temperature and 1830 fps. velocity. At one time such a blast tore loose a well anchored steel matting and sailed it through the air. It may damage asphalt pavement for 50 ft. behind the jet's tail pipe. In portland cement pavements, joint material is melted and blown out of the joints, and aggregate stones are cracked and disintegrated and erosions caused, sometimes 2 in. deep. "One of the most destructive forces that man can turn loose on an airfield pavement is the blast of a modern rocket; a 4,000 lb. thrust rocket generates a blast of 2300° F 18 ft. back from the plane." Rocket assists leave a nitric acid residue on the ground.

Among solutions being studied are selection of aggregate that can withstand sudden intense heats, such as non-glassy slag, Lelite,



Courtesy Calif. Hwys. & Public Works

Curve of compressive strength of concrete

hematite trap rock and grandiosite. Also, for binding agents, lumnite cement and pozzulan. Minimizing the number of expansion joints, and underfilling them by ¼ in. are recommended. Quartz beach sand cemented with calcium carbonate withstood rocket launching with only minor sandblast effect. Even steel surfacing of critical areas may be necessary. With cost of airplanes running into millions, additional thousands for airfields to serve them must be considered logical.

"Jet Airfield Pavements;" *Roads and Streets,* May.

Controlling Roadside Vegetation

The use of chemicals for controlling weeds and woody plants along roadsides has become established practice, but is still in its infancy, and improved methods and chemicals are to be expected. However, good results are obtained by proper use of 2,4-D and 2,4,5-T, especially if applied during the fast-growing stage of the plant. If grasses as well as broad-leaf plants are to be killed, sodium TCA (trichloroacetate) can be added. This leaves a toxic residue in the soil that may persist for several months. Sodium arsenite will sterilize the soil, but it is extremely poisonous and should not be used where it will endanger humans, animals or valuable plants or trees. A mixture of 2,4-D and 2,4-5-T sprayed on foliage when the plants are in full leaf, is recommended. For bark or stump treatment, to prevent sending out sprouts, this mixture is used with diesel or fuel oil as a carrier instead of water, thoroughly drenching the surfaces. Most garden crops are sensitive to herbicides and very small drifts of spray can cause severe damage to them and even to fruit trees.

A. Lepore—"10 Ways to Use Herbicides to Control Roadside Vegetation;" *PUBLIC WORKS,* June.

Continuing Use of Street During Redressing

In Portland, Oregon, all downtown streets are one-way. This simplifies the repairing of the asphalt pavements without closing them to traffic, since little confusion results from confining all traffic to one half of the street while the other half is being repaired. All maintenance is done by the city by force account and the city owns its paving plant. The asphalt is

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spread when it is almost cold, and traffic turned onto it at once after rolling has been completed. Although wheel marks of trucks show at first, since the streets are one-way and wide, traffic does not travel in fixed lanes but spreads and compacts all parts of the surface. During the fiscal year 1950-51, the city laid 650,418 sq. yd. of paving for maintenance or repairs, at an average cost of 74½¢ per sq. yd.

Guy Browning Arthur — "Plan Your Street Maintenance on Business-as-Usual Basis;" *PUBLIC WORKS*, June.

Anti-Skidding Seal-Coated Pavements

During the past two years the California Div. of Highways has developed a new method of roughening slick seal-coated pavement surfaces, particularly adapted to newly laid seal coats where too much binder has flushed to the surface of the screenings course. The treatment consists of heating the surface and then grooving it with a rake-type drag, which turns over the submerged screenings. The heat does not penetrate below the seal coat and is rapidly dissipated, and little of the seal coat aggregate is whipped off by traffic. The heat is provided by flame apparatus (used also for burning weeds) under a long metal hood, dragged behind a truck. Behind this is towed a drag formed in two sections, each containing a row of 80-penny spikes so spaced as to produce grooves 1½ in. apart. Recent drags have used two units in the front section and three in the rear section, to adjust themselves to irregular surfaces. The treatment has cost from $300 to $500 per mile of two-lane pavement.

N. R Bangert—"New Method of Roughening Slick Seal Coated Pavement Surfaces;" *California Highways*, April.

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Tar-Treated Stone Base Roads in Wayne Co. Mich. By *John E. Hiltz*, Engr. of H'way Maint. May, P. 84.

• • •

How Good Construction Safety Practices Save Money

HOW the Construction Division of the du Pont Co. has integrated safety into all of its field construction work over the past twenty years was described by J. A. De Luca, Construction Division Safety Superintendent of du Pont in a paper before the Western Pennsylvania Safety Engineering Conference held last April. The construction work referred to has included heavy construction of new plants for du Pont's own interests, as well as large projects built for the Government. The commercial projects varied in duration from 6 months to 36 months and employed construction forces of 100 to 2,000 men. The Government projects varied in size from 300 to 45,000 men.

Irrespective of the size of the projects, financially or in manpower, and irrespective of the end product, whether commercial or governmental, safety engineering techniques were the same. The differences in their application has been a matter of proportion only. The general objective has been to create understanding and appreciation of the methods and techniques so that insurance carriers and insurance brokers would insure du Pont activities on a progressively improved "Performance Rating."

The average workmen's compensation insurance rate for twelve to fifteen different crafts in heavy construction, over an average of twenty states, during the period 1940 through 1950, has approximated $5.25 per $100 of payroll, based on the "Manual of Rates." The du Pont Construction Division has consistently procured insurance coverage, on the basis of its safety procedures, at $2.00 per $100 of payroll. This was based on the performance rating prior to the conclusion of insurance contracts. In almost every case, insurance was obtained from carriers and brokerage groups on the basis of a further rate reduction below 2 per cent. Below are two examples of the effect on insurance of proper safety management:

Illustrative Examples

A commercial project in Texas was covered by an insurance carrier who, after considering du Pont's performance rating, granted a rate of $4.80 per $100 of payroll. When, after a year or more, the insurance carrier had found out for himself what du Pont calls accident prevention technique, he volunteered a rate of 43 cents in place of the $4.80 rate. On a very large government project, early this year, the rate was reduced from an original performance rating of $2.00 to 76 cents per $100 of payroll, with an abundance of reserves withheld. After the reserves have been held sufficiently to cover all limitations of the law, the rate will actually be 22 cents per $100 of payroll.

As an example of the cost of an adequate program, a construction project in 1947 was executed which required 16,199,413 hours of work, for which the average rate was $1.75 per hour. The cost of the safety program, adequate in every respect, was $164,490, which represent slightly more than one-half of one per cent of the payroll dollars—actually 0.58 cent per payroll dollar. On a 1951 project which required 15,515,688 hours of work, for which the average pay was $2.10 per hour, the cost of a fully adequate safety program was $179,563, representing 0.55 cent per payroll dollar.

The cost of these safety programs was made up of the following: Safety personnel salaries, 5 per cent; safety equipment, 15 per cent; and time spent on reminders and education meetings, 80 per cent.

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HIGHWAY RESEARCH BOARD *Recommendations* FOR TURF SHOULDERS

TURF may be most effective for controlling erosion on highway shoulders and experience has shown that a road shoulder can be stabilized so that it will support safely any vehicle normally using the roadway while producing a turf sufficiently dense to control erosion. In design, the shoulder should be considered as a structure. Inclusion of organic matter or humus may impair its strength and is not necessary for growing turf, especially in humid climates. In such areas, turf can be grown on a wide range of soil materials, without topsoil or humus. This does not apply to shoulders used regularly, as for bus or mail turnouts. Here, the use of the same tracks even once a day will prevent growth, and some other treatment is necessary. The following information is from the Board's Circular 114.

Design of Turf Shoulders

Because of the surface characteristics of turf, the maximum slope which is safe and does not cause erosion is best for adequate drainage and low maintenance cost. Traffic tests and current practice in at least three northeastern states indicate that the shoulder pitch or slope may not be flatter than 1 inch per foot.

If they are to support the load to be carried, the subgrade and surface course must be considered as as entity. For the surface course, the Committee on Stabilized Turf Shoulders recommends materials specified by the AASHO for stabilized surface courses (AASHO M 61-42) or other suitable materials. This material should be compacted to obtain the required bearing capacity, since turf, as a surface material, has shear value but no bearing value in design.

For special cases, such as mailbox turnouts, where uniform appearance of turf may be desirable, stone blocks or equivalent materials locally available may be set on an appropriate bed and the joints seeded to establish an eventual more or less complete cover of turf.

The turf may consist of any type of appropriate vegetation which provides a satisfactory wearing surface. The permanent grasses are desirable, of course, for their longevity. Recovery after damage by traffic is also a factor. Where grasses cannot be successfully maintained, other native herbaceous vegetation may serve.

Establishment of Turf

Fertilizer should be used in such quantities as are required by the soil and type of vegetation. (A recent N. Y. State Department of Public Works specification for a contract on Long Island, where soil conditions approximate 8 percent of fines, require 100 lb. of nitrogen, 200 lb. of phosphorus, and 100 lb. of potash per acre.) Lime should also be used, as indicated by pH analyses and as required to supply calcium as a food element. While most authorities agree that fertilizer and lime should be incorporated in the soil, surface applications have been successful.

Seeding may be done immediately before rolling for compaction, without seedbed preparation, provided subsequent grading will not disturb the seeded area. However, at least one report tells of successful seeding of a compacted surface (without seedbed preparation) when the seed was covered with mulch. Seeding may be done at any time of the year if mulch is properly applied.

In most of the work done, an organic mulch such as straw or hay has been used. In the area near the pavement, this should be anchored to prevent removal by wind or traffic. A light cover of soil placed on the mulch by a sand spreader will hold it down. Mulches of inorganic materials, such as sand, have given satisfactory results also, it is reported.

Shoulder Maintenance

Maintenance is the most important item in developing turf on stabilized soil. The grass should be mowed as required; in cool humid regions, the height of cut should be a minimum of 3 in.

Where soils have few fines, maintenance fertilizing is particularly necessary—generally once a year and in amounts to supply sufficient nourishment. Thrift and density of plant growth are the best indicators of the treatments needed.

Build-up is a recurrent problem. Reasons for it are not fully known, but it does occur—as much as 1 in. in 5 years on a sandy soil on Long Island. Rolling with heavy equipment at a time when the soil's moisture content is suitable for compaction restores desired grades without damage to turf on granular materials over a well drained subgrade. Removing accumulated material such as anti-skid materials also helps. One state regularly brooms it road shoulders.

If blading built-up shoulders becomes necessary, it should be done so as to provide the maximum slope permissible for safety and erosion control. This will insure adequate surface drainage and postpone the need for future blading by just that amount of extra slope. Too shallow a cutting to save turf may be false economy; it is sometimes less expensive to reseed than to blade frequently.

Unanswered Questions

The Project Committee on Stabilized Turf Shoulders is presently studying the following questions and would welcome any helpful information on the following:

1. What cross-section design of shoulder should be recommended to retain traffic safety under all conditions, and yet obtain the best drainage possible and reduce the frequency of blading necessitated by build-up?

2. What are the reasons for build-up, and what treatment is necessary to eliminate or minimize it? (It has not been proved that build-up is due to growth of turf; some authorities consider it characteristic of certain soil materials.)

3. Is subsidence of shoulders a problem where an adequate cover of turf is maintained?

4. What are the construction and maintenance costs of stabilized turf shoulders as compared with those of other types?

A selected bibliography on stabilized turf is appended to the report.

• • •

Cost Accounting System Reduces Water Dep't. Costs

Net operating costs of the Dayton, O., water department were reduced $100,000 the first year, and an additional $38,000 the second year through the installation of a cost accounting system. Savings in personnel costs for the second year amounted to $20,000. The system cost $35,000 to install. Russell E. McClure is city manager.

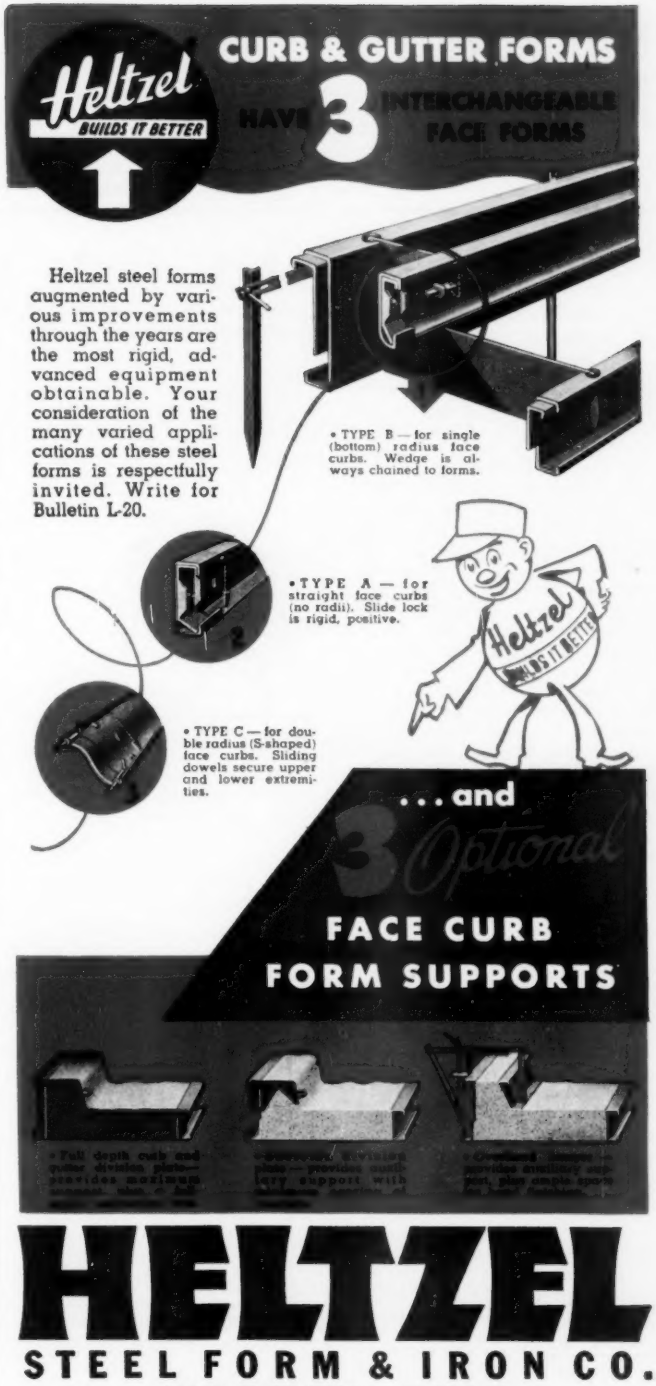
Electronic Brain Directs Downtown Traffic

An electronic master controller for all downtown traffic signals has been placed in operation by Denver, Colo. Costing over $100,000 and requiring two years to construct, the controller keeps a constant running count on downtown traffic, electronically computes the direction in which the largest amount of traffic is moving and alters signal light timing to lengthen green lights for that traffic. Before the change, lights operated on fixed time intervals which remained the same for light or heavy traffic, inbound or outbound. The traffic signal calculations are made every six minutes; traffic cycles may vary from 40 seconds in light traffic to 120 seconds when traffic is heaviest. The controller is custom-made, designed by the city's traffic engineer and constructed by assembling equipment manufactured by several different companies. Provision is made for installation of traffic signals at every downtown intersection. The system has cost to date approximately $115,000, about $1,000 per intersection—not much more than the former inflexible system cost.—American Municipal News.

• • •

Allocating Costs of Joint Sewage Treatment

Two California cities, San Bruno with 16,000 population and South San Francisco with 23,000, are operating a recently completed joint sewage treatment plant, employing sedimentation and sludge digestion. About half the total combined sewage is industrial wastes from South San Francisco; there is no industrial waste from San Bruno. The industrial wastes reach the plant in a separate sewer, unmixed with domestic wastes, and are kept separate throughout the plant; except that the sludges from both are combined for digestion. This permits allocation of the costs of operating the plant between the two cities. South San Francisco pays all the cost for treating the industrial wastes. The cost of treating the domestic wastes is allocated, 60% on the flow factor and 40% on the load factor. This works out so that South San Francisco pays 81.5% of the entire cost of operation and San Bruno 18.5%, subject to revision in case of future changes in relative quantities. The employees are selected by both cities and are under civil service.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PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

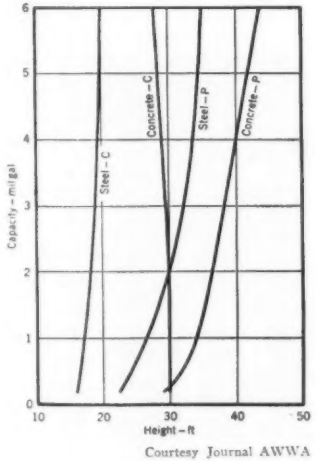
Proportioning Concrete Tanks for Minimum Steel Content

The author has compared the amounts of concrete and of steel required in cylindrical tanks, both with conventional reinforcement and prestressed, and with spherical and elliptical domes, for capacities from 200,000 to 6,000,000 gal., with the following results: All capacities above 2 to 3 mil. gal. should be covered with elliptical domes for conventional designs; all smaller conventional designs and all prestressed should employ spherical domes. For conventional design, minimum quantities of concrete are required by using a relatively constant height ranging from 30 ft. for the smaller capacities to 28 ft. for the larger. To secure minimum steel requirements, heights vary from 16 ft. for the smallest to 20 ft. for the largest. For prestressed designs, minimum concrete is required by 29 ft. for the smallest to 44 ft. for the largest; and minimum steel by 22.5 ft. to 45 ft. Comparing conventional and prestressed designs, the prestressed requires 78% as much concrete and 54% as much steel as the conventional for the smallest capacity, and 63.5% as much concrete and 38% as much steel for the largest.

E. B. Meier — "Proportioning Cylindrical Reinforced Concrete Tanks for Minimium Steel Content;" *Journal, American Water Works Ass'n*, May.

Eliminating Surge and Water Hammer

Washoregal, Wash., water supply is obtained from 5 deep wells with turbine pumps, 3 at Sta. 1 and 2 at Sta. 2, 3 miles away; the latter to maintain pressure at the extreme end of the system. Several types of pump controls were installed, to maintain head of water in the tank and the pressure in the distribution system controlled by Sta. 2. Float switches, pressure gauges and other types of control proved inaccurate or otherwise troublesome. One trouble was that, when power failed with two or more pumps operating, and then returned again with both pumps connected, unless there was excess capacity in the transformer bank another power failure would result. To remedy this synchronous relays were so installed that, when power is off temporarily and is restored, no connected pump will start operating for 4 minutes, and if a second pump is connected, it will not start until after another predetermined interval. At Sta. 2 the pumps were controlled to start when pressure fell to 58 lb.; and the pressure immediately surged to 125-130 lb. and then settled down to 61 lb. When the pumps were stopped, similar surging took place. This was remedied by installing a bypass between the pump and the main-line check valve. Now the pressure control, instead of immediately starting the pump, first opens the bypass valve (which will allow only as much water to pass through it as is normally pumped), then closes this and the main check valve opens.



Courtesy Journal AWWA

Proportioning concrete tanks, conventional and prestressed designs.

Accurate indication at the station of the water level in the tank and control of pumps to maintain the desired level, was not possible by relying on pressure in the main, so water level in the tank is transmitted electrically over a leased telephone circuit, with accuracy of 0.25 ft.

John S. Shute—"Remote Controls to Eliminate Surge and Water Hammer in Water Systems;" *Journal, American Water Works Ass'n*, May.

State Control Of Fluoridation

Fluoridation of public water supplies in Tennessee is subject to the approval of the Department of Public Health, and it is the responsibility of the Sanitary Eng. Div. to determine if competent operating personnel and satisfactory equipment are available to insure proper treatment procedures. Approval of fluoridation is not granted to a plant which has not already a record of satisfactory water system operation and maintenance. Since 1939 the Division has carried on a rating and approval program for public water supplies. The rating system applies 38 points to operation and maintenance, 42 to physical equipment and 20 to final water quality; a total of 90 points being required for approval. Unless or until a plant has obtained such approval status, fluoridation is not approved. Among the requirements of the equipment for fluoridation, accurate control of the process is a "must." Daily tests of the treated water, and checks of the total amount of chemical used against the amount of water treated. are called for.

J. Wiley Finney, Jr.—"If You Want Fluoridation, Set High Standards;" *PUBLIC WORKS*, June.

Standards for Water Distribution Systems

At the request of the Michigan Dept. of Health, the Michigan Section of A.W.W.A has adopted "Minimum Standards for Design, Construction and Maintenance of a Public Water Distribution System, to insure the functional, structural security, and sanitary protection, of public water distribution systems. . . . These standards are to be interpreted as indicating the minimum requirements and not necessarily the recommended or desirable requirements."

Among the functional requirements, they specify that, for mains with an unconnected (dead) end, 2″ and 3″ pipe should not have runs of more than 300 ft., and 4″ not more than 1300 ft.; with both ends connected these lengths can be doubled. None of these is to be used for fire service; except that not over 600 ft. of 4″ with both ends connected can be so used temporarily. Valves should be so located that no single accident will necessitate shutting from service more than 500 ft. of pipe in a high-value district, or more than 800 ft. in other sections, or shutting down any artery. At each functionally important gate valve and all valves 16 in. and over in diameter, and at each air relief and blow-off valve, a vault or manhole should be provided. Pipe used for mains should be cast-iron, asbestos cement, reinforced concrete, or steel, meeting Federal or AWWA specifications. For joints, jute or oakum should not be used for packing. Water mains and sewers should not be laid in the same trench. Other specifications relate to crossings of streams and railroads; to storage tanks and reservoirs; to construction sanitation; cross - connections; maintenance personnel and equipment.

"Minimum Standards for Design, Construction and Maintenance of a Public Distribution System;" *Journal American Water Works Ass'n*, May.

Methods of Installing Pressure Pipes

The Washington Suburban Sanitary District, Md., has used six types of pipe in water main construction—pit-cast and centrifugally cast iron pipe, reinforced concrete, steel, asbestos-cement and wood-stave. The last was part of a system purchased by the commission; the wire wrappings of the pipe are deteriorating and it is being replaced with cast iron. All the other types have proved satisfactory. Various types of joints and kinds of jointing materials have been used. For b&s joints, sulfur compounds have replaced lead, except in special locations where leaks may develop. The sulfur joints have been used for almost 30 yr.; they have very high initial leakage but this practically stops in 2 to 6 months. In 1950 they began use of mechanical-joint pipe, with gaskets of rubber with a duck back and lead tips; these they find to be perfectly tight. The cost of the pipe itself is 10 to 12% greater than that of b&s pipe, but laying costs 10% less. the joints are tighter and more flexible, and the pipe line more sanitary.

Before laying steel pipe, the soil in which it is to be placed is tested for specific acidity and pH at intervals of not over 400 ft. If the soil is found to be corrosive, sufficient lime is placed in the backfill to make it non-corrosive. The coal-tar enamel coat is spark-tested for holidays just before the pipe is lowered into the trench. Dresser couplings are used for joints. Taps

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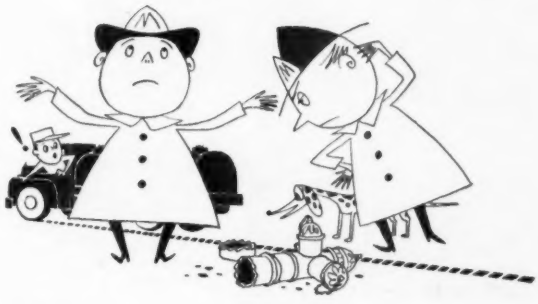

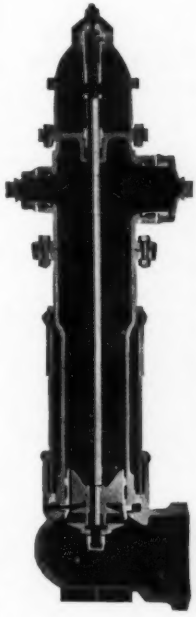

The main valve opens against water pressure and closes with it. This is foolproof protection against flooding when hydrants are broken in traffic accidents.

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made in pipes after 15 yr. in the ground showed the coal-tar pitch lining to be in good condition. Steel-cylinder, prestressed concrete pipe laid in 1943 showed an average leakage of 60% of that specified—100 gpd per in. diam. per mile.

Ray A. Jackson—"Installation Experience With Pressure Pipe, Joints and Linings;" *Journal, American Water Works Ass'n*, May.

Combined Treatment of Both Hard and Soft Water

Pulaski, Va. for some years obtained water by gravity from an impounding reservoir. This water was very soft. In time the quantity became inadequate and additional supply was obtained from a spring from limestone rock, which has a hardness of 250 to 350 ppm. The soft water is used until the water in the reservoir becomes undesirably low, when it also contains increased concentrations of iron and sulphur. This occurs every fall. The combined flow from the two sources is more than sufficient for present needs, but there was much objection to the quality; so the town last year built a plant for treating both the hard and soft water. Soft water passes through coke tray aerators to stabilize the iron and sulfur; is treated with alum, soda ash or lime and then passed through an "Accelator." The hard spring water bypasses the aerator and lime is added to it at the entrance to the "Accelator." Leaving this, the water passes through a carbon dioxide contact chamber. (For several months of the year, when only the impounded water is used, only plain sedimentation will be necessary.) Final treatment consists of passing the water through slow sand filters.

W. Martin Johnson—"Pulaski's New Water Softening and Filtration Plant;" *Water & Sewage Works*, May.

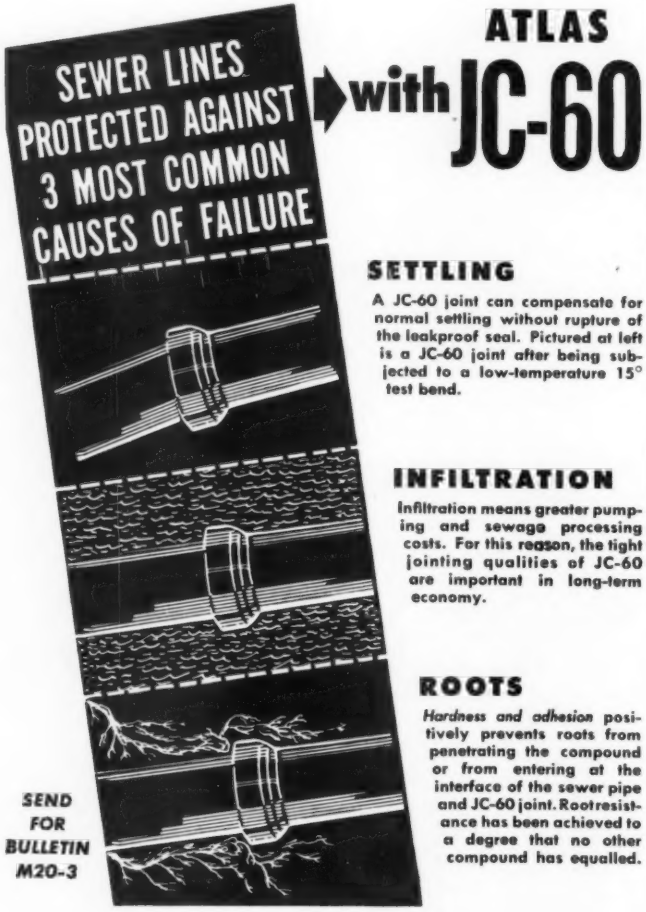
The Problem of Silt in Reservoirs

Silt accumulating in reservoirs may so reduce their effective storage capacity as ultimately to make it entirely inadequate, and it seldom is practicable to restore the capacity by removing the silt. The solution of the problem presented may be found in minimizing the sediment carried by the stream, in some cases. In any case, the capacity of a reservoir should be made as large as feasible in relation to the area of its watershed. The former can often be effected by control of erosion on the watershed. This will generally be to the advantage of the owner of the land, also; and much can be done by educating the owners to a realization of this fact. There are in general three types of reservoirs: 1—Those in which the entire storage is within the banks of the stream; in these there is little permanent accumulation of silt. 2—In which storage utilizes a part of the stream valley as well as the stream bed; this type probably suffers most from siltation. 3—Those on small streams where most or all of the runoff is impounded; these are usually least seriously affected.

N. T. Veatch—"How Much Silt Can a Reservoir Stand?;" *American City*, June.

Suburban Main Extensions

The increasing demand for extensions into suburban territory, together with today's high costs of such extensions, makes it imperative that extension rules be revalued and redesigned. Many rules which were equitable 10 or 15 years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ago are not so today; some never were. The total income of the utility from rates must equal a certain sum. If extension terms are overly favorable to new customers, they have to be unfavorable to old ones; including the subsidy given to the new ones. The rates for suburban consumers should be higher than for city dwellers for several reasons. The Pennsylvania Superior Court ruled: "A municipal water company may serve residents within the city at cost, but is entitled to a profit on service in territory outside its boundaries." City rates are based on average costs to serve all consumers; but the costs are greater near the city limits than in its center, and outside the limits they will be still greater, and hence much greater than the city average. City rates usually contain no charges for facilities which have been paid for by tax assessments or by previous surplus, to which new suburban consumers have not contributed. If supplying suburban customers will require enlargement of plant or mains, the cost of this at today's prices must be considered. The author gives calculation for rates under a more or less common condition which justifies rates outside the city practically double those inside.

W. Victor Weir—"Suburban Main Extension Policies;" *Journal, American Water Works Ass'n*, May.

Protection Of Steel Water Tanks Against Corrosion

Long Beach, Calif., Water Dept. has 12 steel tanks. Six of these, built in 1936, were protected on their interior surfaces with coal-tar enamel, and are still in excellent condition. When properly applied, coal-tar enamels are impervious to moisture, make a tight bond with the steel surface, and maintain a high electrical resistance. Failure is invariably due to faulty application. The other 6 tanks at Long Beach, built in 1932, were coated with an enamel different from that now in use and began to show failure after 11 or 12 years of service. To remove the old coat, sand-blast, and properly apply a new coat would cost about $8,000 a tank, and the use of cathodic protection was investigated and adopted. The cost of this equipment, installed, was $1460 per tank in 1945. The cost for electric energy is $26 per year per tank. One tank was emptied after 7 months' operation, and it was found that the rust which had formed on the bare spots had been raised from the surface of the steel and beneath it a white, chalky film had formed on the bare steel. This protection of course is limited to the area below the average high-water line.

C. Kenyon Wells—"Cathodic Protection of Steel Water Tanks;" *Journal, American Water Works Ass'n*, May.

Magnesium Anodes in Cathodic Protection

Magnesium has the greatest solution potential of all commercially available metals, thus making it ideal for cathodic protection use, and magnesium anodes have been used successfully on the inside and outside of steel tanks. For protecting pipe lines, the overall cost has proved slightly higher than that of rectifier-type cathodic protection, but its ease of handling and adaptation have more than offset the additional cost. Protection of tanks with magnesium costs considerably more per sq. ft. but often appears justified because of its light weight and ease of handling.

L. E. Magoffin—"Use of Magnesium Anodes in Cathodic Protection

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of Tanks and Pipelines;" *Journal, American Water Works Ass'n*, May.

For pipeline protection, magnesium anodes find their most efficient usefulness in soils ranging in resistance between 100 and 2,000 ohms per cu. cm. and are economical when current requirements are low. The effective potential of a magnesium electrode against steel, when stable operating conditions are attained in actual practice, is generally between 0.6 and 0.7 v. The current required to protect a given steel line is dependent on the soil resistance and the wrapping resistance on the line.

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Plan Algae Control Research and Studies

The Connecticut Legislature has appropriated $25,000 to the State Water Commission for conducting

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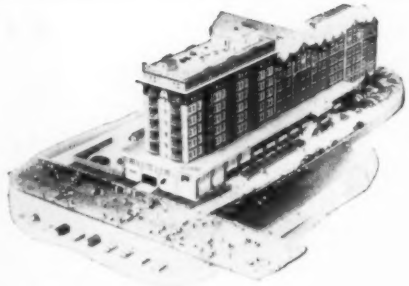

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research and studies on algae control. Under the program, a pilot plant will be built and operated this summer for removing phosphorous from sewage in an effort to determine whether or not the removal of this nutrient will be sufficient to control the growth of algae. The plant will be installed at the Fairfield State Hospital, a State institution which operates a secondary sewage treatment plant consisting of high rate trickling filters and sand filters. The effluent from this plant will be used in the phosphate removal treatment and in the algae studies. The actual investigations will be carried on in two large lagoons each 400 feet long by 50 feet wide and about 6 feet deep.

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Soil Percolation

(*Continued from page* 48)

application of statistical procedures. The reliability of the data does not justify this.

With proper performance of the percolation test over an area sufficiently large to meet absorptive needs, or identification of the soil types within this area, it is believed that the suggested formulas can be used with confidence.

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• • •

California Freeway

(*Continued from page* 53)

most beautiful in the West, is of concrete arch construction, 430 feet long and 26 feet wide. It carries two eleven-foot traffic lanes of bituminous surfacing, and two two-foot paved shoulders. The arch span is 160 feet, and the deck is 113 feet above the bottom of the creek channel.

The new bridge, which replaces the former high steel truss structure which was only 95 feet above the stream-bed, epitomizes the latest in bridge design and construction. Because of the steep rocky canyon and the extreme height of the bridge, the laying out and construction of the arch rib presented a major engineering problem.

Bridge Construction Data

All of the layout work was done by means of intersecting transit lines, rather than by tape measurements, in order to assure accurate location of the columns and the control points of the arch rib. First, a base line was established along the side of the canyon parallel to the bridge centerline, and all the points for the bents and on the arch ribs were intersected from this line. By using this method of intersecting line, the engineers were able to construct the arch rib and the spandrel columns with an unusual degree of accuracy.

Another feature of the bridge construction interesting to engineers was the laying out of the full-scale template on which the forms for the ribs were built. The curvature of the side forms of the arch ribs as well as the exact locations of the falsework stringer caps and the curved soffit segment were laid on this template. All the timbers were then cut to fit as closely as possible.

The falsework for the deck structure was supported on steel beams inserted through openings which were left in the top of the spandrel columns. After the work was completed, these openings were filled. The concrete for the bridge was mixed on the bank, and wheeled in buggies out over the falsework. The bridge, which springs from solid

rock on each side of the creek, is one of the highest and longest of its type in California.

The new road was planned to be passable during all seasons of the year, without danger of flooding, landslides, or erosion. Besides its year-round usability, the freeway also offers other advantages both to visiting motorists and to the thousands of farmers, fur-ranchers, resort-owners, cabin owners, cattle-ranchers and orchardists, many of whom spend most of the year in the mountains.

The new road shortens the distance to mountain resorts by from five to fifteen miles, depending on the destination of the motorist. Driving time is similarly cut ten minutes to forty minutes. Moreover, the new road drops down directly from the mountain top, thus elimlnating the necessity for motorists to drive several miles through the dense fogs typical to the area during certain seasons of the year.

Most important of all is the fact that the new road will undoubtedly reduce traffic accidents in the mountains, as sharp curves have been eliminated, the grade is easy, and visibility is excellent. In fact, the new road is regarded by engineers as one of the finest in the country, not only in construction but also in scenic attraction. The road leads through and into some of the most magnificent scenery to be found anywhere in the world. It is truly a "palms to pines highway", for it leaves the semi-tropical climate of San Bernardino with its plantings of palms and orange groves, and rises by easy stages up into great pine forests where mountain meadows are dotted with alpine flowers and shrubs, which during the winter are covered with many feet of snow.

• • •

Water Pipe Joints

(*Continued from page* 51)

used, particularly in the Pacific Coast area, with some success. The labor costs are higher for cement joints than for hot-poured joints and it is difficult to secure a joint that is completely full[8]. In the preparation of this type of joint, 1 gal. of dry cement is mixed with 1 pt. of water and this neat cement is caulked in the joint. It is of great importance to ascertain that the cement joint is well caulked all the way around, that joints are not made in freezing weather and that no pressure test is made until at least two weeks after their installation.

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There are a large number of patents describing various types of mechanical joints but only a few have been commercialized. One type of mechanical joint is the sleeve type which consists of a middle metallic ring with two rubber rings sandwiched between two other metallic rings compressed by a set of bolts. The universal joint consists of a shallow bell and spigot machined on tapers of different pitches and drawn together by means of bolts and lugs. Threaded joints are also used occasionally but such a rigid construction requires occasional expansion joints to compensate for lack of flexibility.

Any report in a dynamic field must be a progress report rather than a final one. Not so many years ago, there were 92 elements and with the exception of isotopes, additional possibilities were not even considered. The modern periodic table now leaves blank spaces up to 100 to satisfy any new discovery which might make a more conservative table obsolete. There is, of course, a parallel in the water distribution field. Just a few years ago, it would have been considered heresy to suggest adding fluorides to water. Today the progressive engineer will not refuse to listen to suggestions that minerals or even medicinals be added to the water supply.

This broad type of thinking extends to the field of jointing materials where both waterworks engineers and suppliers are exploring every possible material for water distribution with a complete lack of bias. A research point of view coupled with the intention of using only those materials that can be proved to be functionally correct may make some present materials and methods obsolete. However, this type of progress is essential if the supplier is to be of greater service to the waterworks engineer and he, in turn, to the American public.

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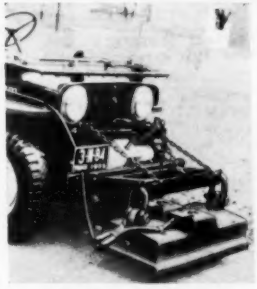

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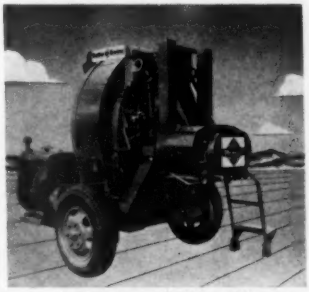

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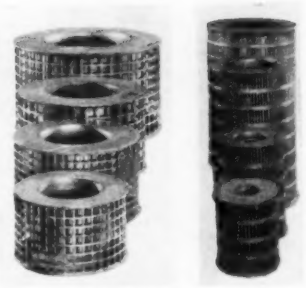

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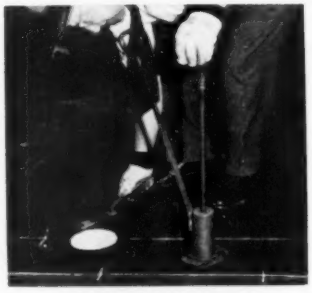

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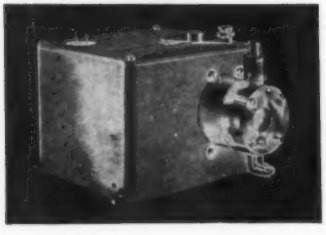

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TO help small communities get the most modern and usefully long-lived plants possible the Editors of PUBLIC WORKS and outstanding authorities in the field prepared a series of articles on Small Treatment Plants. These seven articles, first published in PUBLIC WORKS, cover volume of flow, primary settling, sludge digestion and disposal, activated sludge and small trickling filter details and design. The comments of a number of State Sanitary Engineers show typical State Board of Health requirements and recommendations.

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Plant layouts, tables and design details especially adapted to small plants are included together with money saving suggestions.

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Smokestacks, furnace walls and other places requiring high heat resistance can be protected with Lankote 620, which is a silicone-aluminum paint. This can be brushed or sprayed on and is claimed to protect against corrosion, deterioration or weathering at temperatures up to 1,000°F. Literature and samples can be obtained from Lankote Division, J. Landau Co., 221 Wooster St., New York 12, N. Y., or use the coupon.

Use coupon on page 26; circle No. 7 - 13

Self-Priming Centrifugal Pumps with Many Improvements

Three larger sized pumps, namely 20M, 30M and 40M, have been announced by Rice. These are self-priming centrifugal pumps and bring the Rice line to seven sizes, 4,000 to 40,000 GPH. The new pumps conform to AGC requirements and are available on skids or wheels, as desired. More information on all seven sizes from Rice Pump & Machine Co., Grafton, Wisc., or by using the coupon.

Use coupon on page 26; circle No. 7 - 14

Tilting Plaster-Mortar Mixer 3 to 4 Cu. Ft. Capacity

This plaster-mortar mixer is portable, has a low charging height and a drum that can be tilted in either direction for quick and thorough cleaning. Power is provided by a 3-hp air cooled engine. There are four non-clogging saw-tooth blades to insure perfect mixing. Width is 29 ins.; shoveling height is 37 ins.; tow pole is telescopic. Full data from Kwik-Mix Co., Port Washington, Wisc., or use the coupon.

Use coupon on page 26; circle No. 7 - 15

Hydraulic Dump Truck Hoists and Bodies

There are 14 models of this new line of St. Paul dump truck hoists and bodies, with capacities ranging from 6 to 25 tons. Features include a very low standard mounting height; an advanced lifting point; low operating oil pressures; a new subframe; and roller bearing drive mechanism, including pump and power takeoff. More payload than previous models is claimed. Data from St. Paul Hydraulic Hoist, Wayne, Mich.

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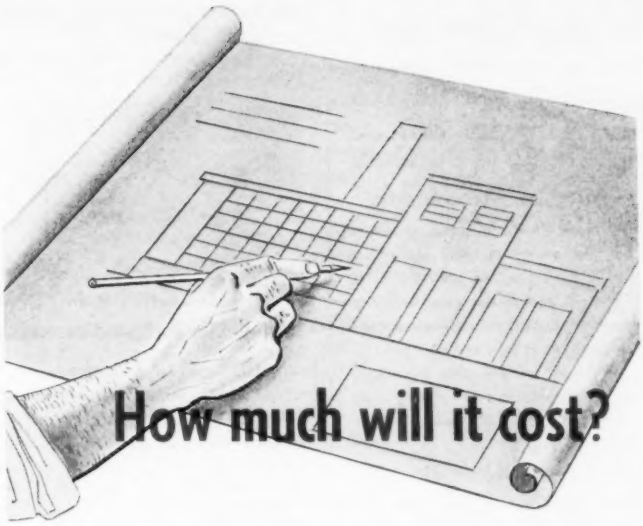

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Also interested other items of steam industrial, railway, etc. machinery. The older the better. Not necessary be in operating condition as wanted for museum purposes.

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Address applications, giving full particulars, to A. V. Aronson, City Manager, Escanaba, Michigan.

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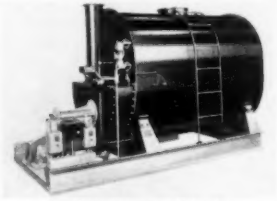
This new heater is a self-contained fully automatic heating unit operating on the principle of a closed heating system vented to the atmosphere. The unit is always at atmospheric pressure. It is fired by a pressure atomizing type oil burner suitable for oil having a viscosity not exceeding 50 seconds, Saybolt Universal. Mounted integrally are pump, valves, piping, temperature and oil controls and the motor and controls. More data from Cleaver-Brooks Co., Milwaukee 12, Wisc., or use the coupon.



Asphalt heating booster

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How to Make Adjacent Concrete Pours Watertight

Water stops are always needed to prevent leakage between adjacent pours of concrete. This is a plastic joint seal that may be used with assurance where shrinkage openings not in excess of ½-inch are expected. It is fine for water and sewage plants, dams, swimming pools, foundations, walls and floors. Full description in Bull. LW-2 from Water Seals, Inc., 400 West Madison St., Chicago 6, Ill.

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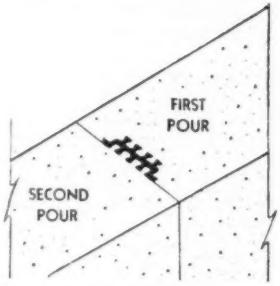
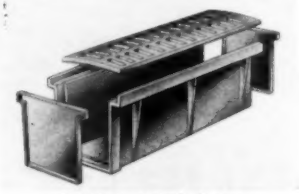


Makes joints tight

Solving Drainage Problems by Prefabricated Units

The basis of this system is a unit which consists of a center piece or receptacle, a top grating and end pieces. These fit together by slip joints, so any desired length can be placed. Parts are of cast iron, designed to sustain heavy wheel loads. There are no forms to build. Units can be set in concrete, or in earth. Cleaning is simple and requires only the removal of the top grating. More information from Standard Foundry Products, 220 W. 42nd St., New York 36, N. Y., or use the coupon indicated below.



Prefabricated drainage.

Use coupon on page 26; circle No. 7 - 19

How to Renew Your Traffic and Directional Signs

For putting a new coating on your traffic and directional signs, or on any other flat surface materials, a roller coating equipment is now available. It is said to save as much as 50% compared to spraying. Applies lacquers, enamels, paints and similar materials. Covers to 850 sq. ft. with one gallon, and coats 3,800 lineal ft. or 15,000 sq. ft. per hour. Data from L. R. Wallace & Co., 440 Seaton St., Los Angeles 13, Calif.

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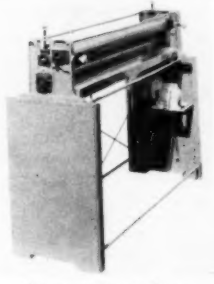

Renews street signs

Single, Double and Triple Deck Vibrating Screens

For screening gravel, crushed stone and clay and making chips for road maintenance and construction, a larger variety of single, double and triple deck vibrating screens are now available. These are very durable and the spring design absorbs vibration. Deck design is parabolic for maximum capacities. Full data from Kolman Mfg. Co., 4700 W. 12th St., Sioux Falls, S. D., or by using the coupon.

Use coupon on page 26; circle No. 7 - 21

Portable Screener-Loader Can also be Used for Snow

This machine combines screening, conveying and loading of sand and gravel. The savings reported in operating costs have indicated that the initial cost may be absorbed in one season's operation. A bucket scoops up the raw aggregate and dumps it into a screened hopper from which the scraper conveyor carries the material to a vibrating screen and chutes for discharge to trucks. Handling capacity is 1,000 tons per day. The machine can be adapted to snow removal. Data from J. C. Corrigan Co., Inc., Boston 22, Mass.

Portable screener-loader

Use coupon on page 26; circle No. 7 - 22

General Purpose Sweeper for Use with IHC Tractor

Specifically designed for use with the International Cub tractor, this is a general purpose power sweeper. The brush is hydraulically raised and lowered and is rotated from the rear power take-off. There is an adjustment to compensate for broom wear and the dust hood over the broom is easily removed for snow sweeping work. Palmyra stalk is employed in the brush, which is refillable. Brush dimensions are 25 ins. diameter and 72 ins. length, giving a sweeping path of 60 ins. Full data from Meili-Blumberg Corp., New Holstein, Wisc., or use the coupon.

Meili-Blumberg sweeper

Use coupon on page 26; circle No. 7 - 23

Hot Radiography for Finding Defects in the Field

The McElroy-McNutt hot radiography process permits field inspection of partially completed welds for possible defects, without waiting for the welded section to cool. This process thus saves many manhours of heating and controlled cooling time otherwise required. Also, if defects are found, only a partly completed weld need be chipped. Sam Tour & Co., Inc., 44 Trinity Place, New York 6, N. Y.

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How to overcome industrial waste problems economically and effectively

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INDUSTRIAL WASTE TREATMENT

By Edmund B. Besselievre

Chief Sanitary Engineer, International Sales, The Dorr Co.

370 pages, 100 illus., 55 tables, $7.00

This working guide helps you launch and carry through a practical program of solution at a minimum cost and maximum results. In it the component factors and economical aspects of the waste problem are discussed, enabling you to properly evaluate them and arrive at a successful solution. It summarizes the functions and jurisdiction of various agencies as well as the laws controlling discharge of wastes into streams.

Tells how to:

- determine the degree of treatment required
- determine the volume of waste
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- treat dairy wastes
- treat wastes from fermentation industries
- treat chemical plant wastes

The methods, treatment plants, and units of equipment available for waste treatment are described, with numerous flow diagrams and photos showing their successful use. To minimize stream pollution and reduce costs of treatment, the book points up considerations of plant design and construction and techniques of reclaiming byproducts from industrial wastes. A wealth of background information—working methods and data you can use to profit, are embraced in this single volume.

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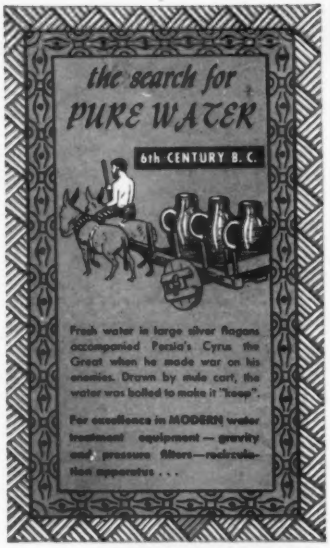
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ASSOCIATIONS

The South Dakota Water & Sewage Works Conference will be held at Pierre, S. D., Sept. 17 to 19. Charles E. Carl, secretary, State Department of Health, Pierre, S. D.

The 21st Annual Georgia Water & Sewage Operators' School will be held at the Georgia Institute of Technology, Atlanta, Ga., Sept. 24 to 26. More information from N. M. deJarnette, Associate Director, Water Pollution Control, State Department of Health, Atlanta.

PERSONAL NEWS

Joseph K. Knoerle has opened an office for the practice of consulting engineering. His address is 824 No. Calvert St., Baltimore 2, Md

Francis S. Friel, president of Albright & Friel, Inc., has been appointed a member of the Pennsylvania State Registration Board for Professional Engineers.

Edward J. Nunan of Buffalo has been elected president of the New York State Society of Professional Engineers. Mr. Nunan is with the Buffalo Slag Co.

The consulting firm of Gray & Osborne, with offices at 1114 Larson Bldg., Yakima, Wash., has been formed, succeeding the firm of G. D. Hall & Associates. Mr. Hall has retired as partner.

M. L. Brashears has been made a partner in the ground water geology consulting practice established in 1944 by R. M. Leggette. The firm name is Leggette & Brashears and the office is at 551 Fifth Ave., N. Y.

Prof. Gilbert H. Dunstan, a member of the faculty of the University of Alabama since 1933, is now Professor of Sanitary Engineering and Sanitary Engineer, Division of Industrial Research, at the State College of Washington, Pullman, Wash.

Frederick Ohrt, for 27 years chief engineer of the Honolulu water system, has retired from that position to devote his time to other interests. He is succeeded by Edward J. Morgan, an engineer who has been associated with the Honolulu water system for more than 20 years.

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HOW TO CONTROL ALGAE

"The Use of Copper Sulphate in Control of Microscopic Organisms" by Dr. Frank E. Hale (former Director of Laboratories, Dept. of Water Supply, City of New York) is an authoritative work concerning the control of micro-organisms and elimination of tastes and odors. Describes in detail methods of controlling various forms of microscopic life commonly encountered in water supply systems. Contains descriptive material, plus 48 photo-micrograph studies of organisms discussed.

ROOT AND FUNGUS CONTROL

"Copper Sulphate for Root and Fungus Control in Sanitary Sewers and Storm Drains," by John W. Hood, contains information published for the first time. This material includes actual methods for control and operating procedure. Here's the book that is a "must" for all sewage men.

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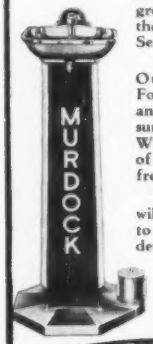

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by Arthur K. Akers

★ **CONGRATULATIONS** to AMERICAN CAST IRON PIPE COMPANY, Birmingham, on the elevation of LESTER LONG to vice president, sales; succeeding J. J. SWENSON, retired.

Mr. Fleming

★ **CATERPILLAR TRACTOR** did a magnificent house - warming job at their new Joliet, Ill., plant. Our LEW. MORRIS, who attended, is still dazzled by it all. CATERPILLAR also announces GALE E. ALLEN as supervisor of Trackson products promotion; HAROLD C. FLEMING, Jr., supervisor of their advertising at Peoria.

★ **ANOTHER** of our new friends has moved up: FREDERICK C. STAKEL, from manager of advertising and sales promotion BERMICO pipe, in Boston, to advertising manager, ALUMINUM COMPANY OF AMERICA, at Pittsburgh.

★ **WILLIAM P. GIBBONS** succeeds HOWARD A. BAIN as advertising manager, industrial products, JOHNS-MANVILLE CORPORATION, New York.

Mr. Hartman

★ **BYRON K. HARTMAN** is new sales manager of the new LINK-BELT COMPANY plant at Colmar, Pa., near Philadelphia, with JOE GILBERT still at his elbow on sanitary equipment sales.

CARL N. BROWN of UNITED STATES PIPE & FOUNDRY COMPANY has been elected President of the WATER and SEWAGE WORKS MANUFACTURERS ASSOCIATION for the coming year. We congratulate both Carl and the Association.

★ **LLOYD R. EARL,** has been elected president of UNITED CONCRETE PIPE CORPORATION, Baldwin Park, Calif., a subsidiary of UNITED STATES PIPE & FOUNDRY COMPANY, Burlington, N. J.

★ **JOHN LARSEN** is promoted to assistant sales manager, OMEGA MACHINE COMPANY, Providence, R. I.

★ **WALTER M. ROBERTS** will be in charge of northeastern sales, WAYNE MANUFACTURING COMPANY, street sweepers. Main office is Pomona, Calif.

★ **SPARKLER MANUFACTURING COMPANY,** filtration equipment, has opened a new branch office and warehouse in Los Angeles. RICHARD E. SHIELDS will be West Coast sales manager there.

★ **ALLIS-CHALMERS** names A. E. DORN industrial sales manager, Tractor Division, Milwaukee; promoted from Pacific Coast sales manager.

Mr. Bachman

★ **WORTHINGTON CORPORATION** re - names its Dunellen, N. J., plant the Plainfield Works. JOHN S. BACHMAN is promoted to manager of paver and mixer sales there. He was formerly assistant manager, construction equipment division of Worthington.

★ **A. Y. McDONALD MANUFACTURING COMPANY** opens its 18th branch, in Dallas, with GEORGE ZIMMERMAN as manager. Complete stocks of "brass goods" will be carried.

★ **JUST PASSING THROUGH.** Someone asked a police captain if he had been brought up in a tough neighborhood. "Tough?" said the copper. "Why, it was so tough that a cat with a tail was recognized as a tourist."

—*Thanks* to The KABLEGRAM

FROM THE CANADIAN BORDER TO THE GULF OF MEXICO... from the Rockies to Lake Michigan, the Ohio and Mississippi Rivers... this is the broad sweep of the Great Plains served by Lock Joint's permanent pipe manufacturing plant at Turner, Kansas. Specializing in Lock Joint Prestressed Concrete Cylinder Pipe in diameters from 16″ to 48″, designed for any pressure common to water works practice, the Turner plant also answers demands for this type of pipe in the Great Lakes area.

...LOCK JOINT CONCRETE PRESSURE PIPE is readily available east of the Mississippi from the Company's three other permanent plants in Wharton, N. J.; Detroit, Mich., and Columbia, S. C. Together these four strategically located plants are equipped to handle any contract, however large or small, and offer the ultimate in modern Concrete Pressure Pipe in a variety of standard diameters.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains 16″ in diameter or larger, as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

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PRESSURE PIPE PLANTS: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

BRANCH OFFICES: Casper, Wyo. • Cheyenne, Wyo. • Denver, Col. • Kansas City, Mo. • Valley Park, Mo. • Chicago, Ill. • Rock Island, Ill. • Wichita, Kan. Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Oklahoma City, Okla. • Tulsa, Okla. • Beloit, Wis. • Hato Rey, P. R. • Caracas, Venezuela

LOCK JOINT
Reinforced Concrete
PRESSURE PIPE

the part you don't see is important...

IN W&T CHLORINATORS, TOO!

When you look at a single W&T Chlorinator you can't *see* the basic research, the complete line of equipment, and the service that are behind it.

For instance, the engineer, the plant operator and the taxpayer all benefit from W&T's complete line of equipment. In the selection of equipment for a water supply — large or small — the engineer can always find a W&T Chlorinator to fit the requirements. The plant operator knows that this complete line can provide a W&T Chlorinator designed to help him provide safe water with his particular plant layout. The taxpayer is assured that money spent for W&T Equipment fitted to the present as well as the future needs of his community will provide long range economy.

These advantages of W&T's wide selection of equipment are probably one reason so many people use W&T Chlorinators.

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